Installation & Maintenance Data

IM 661-1

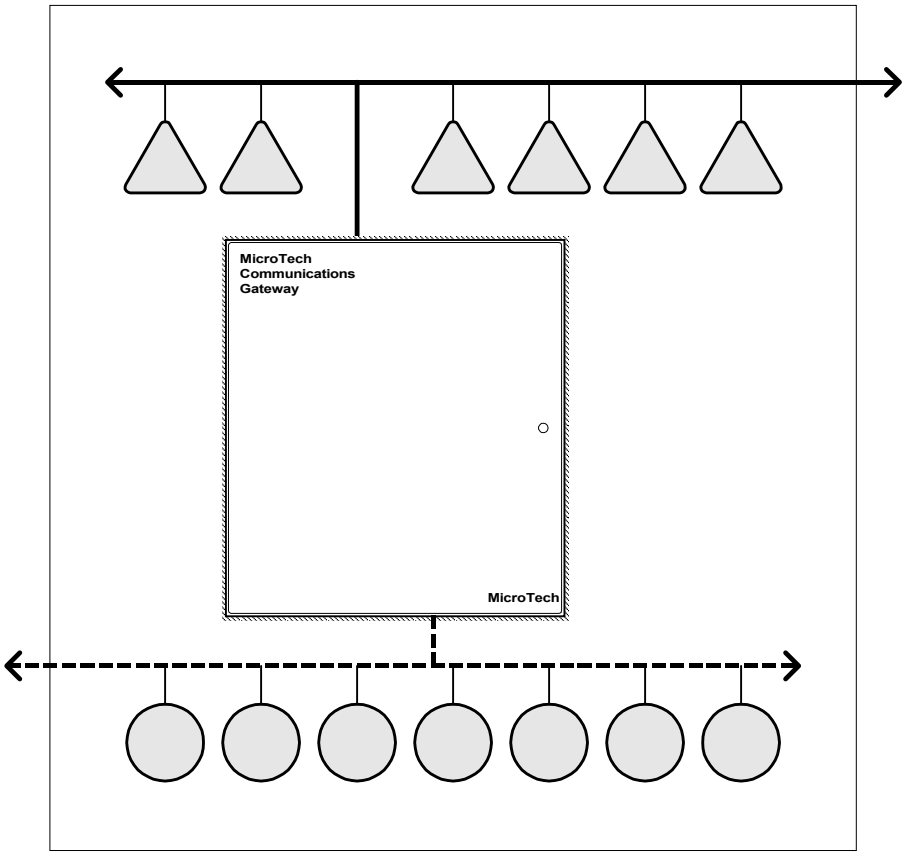
Group: **Controls**

Part Number: **594881Y-01**

Date: **June 1998**

MicroTech®
Communications Gateway

MicroTech 2000™ LonWorks®-Based Controllers



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Introduction

This manual provides information about the MicroTech® Communications Gateway (MCG), which provides an interface between devices using the proprietary MicroTech protocol and MicroTech 2000™ unit controllers using the LonTalk® protocol. It describes the MCG's components, field wiring requirements, network commissioning procedures (MicroTech 2000 side only), and service procedures.

For specific information about the LonWorks®-based MicroTech 2000 unit controllers, refer to the appropriate unit controller installation or operation manual (see Table 1 and Table 2).

Table 1. Unit Controller Installation Literature

Unit Type	Installation & Maintenance Data Bulletin Number
HP	IM 660

Table 2. Unit Controller Operation Literature

Unit Type	Operation Manual Bulletin Number
HP	OM 128

⚠ WARNING

Electric shock hazard.

Can cause personal injury or equipment damage.

This equipment must be properly grounded. Connections and service to the MicroTech control panel must be performed only by personnel that are knowledgeable in the operation of the equipment being controlled.

⚠ CAUTION

Static sensitive components.

A static discharge while handling electronic circuit boards may cause damage to the components.

Discharge any static electrical charge by touching the bare metal inside the control panel before performing any service work. Never unplug any cables, circuit board terminal blocks, or power plugs while power is applied to the panel.

NOTICE

This equipment generates, uses, and can radiate radio frequency energy. If it is not installed and used in accordance with this instruction manual, it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user is required to correct the interference at his or her own expense. **McQuay International disclaims any liability resulting from interference or for the correction thereof.**

General Description

The MicroTech Communications Gateway (MCG) is a microprocessor-based controller designed to provide an interface between systems using the MicroTech proprietary protocol and up to 64 MicroTech 2000 unit controllers that use the LonTalk protocol. Systems that use the MicroTech proprietary protocol include (1) other MicroTech unit or auxiliary controllers, (2) a PC equipped with MicroTech Monitor™ software, or (3) the building automation system of a company licensed for Open Protocol™ communications.

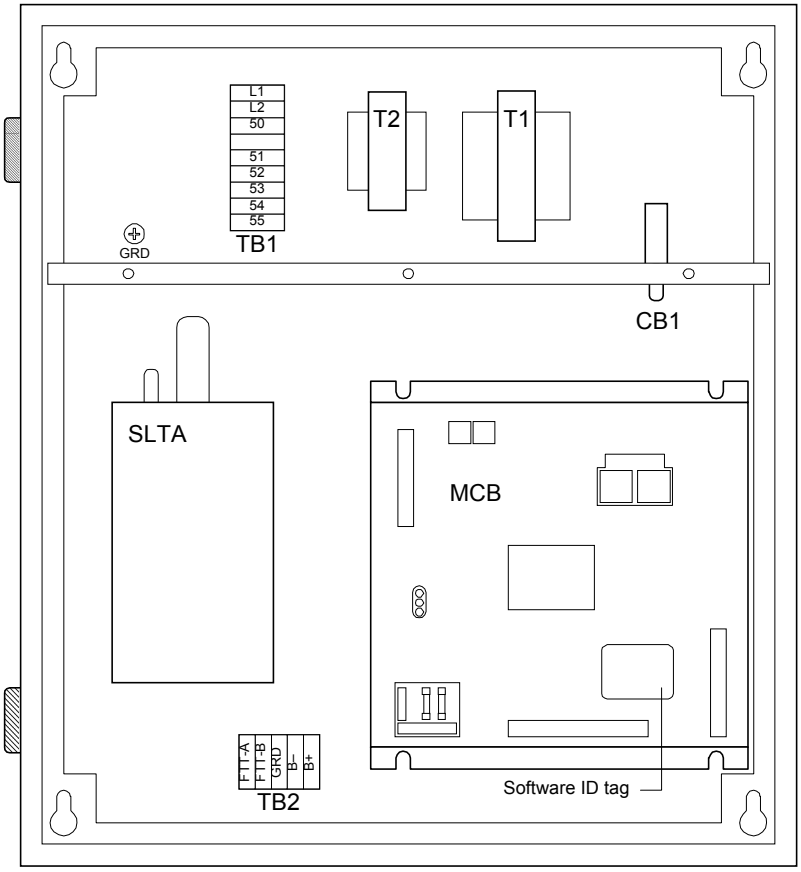
The MCG is available as either the "MCG-L2" (level-2) or "MCG-OP" (level-1). For more information, see the "Applying the MCG" section.

The MCG is a passive device. It simply receives, translates, and transmits messages in either direction across the interface. After it is set up, no further adjustments are necessary.

Component Data

The MCG control panel layout is shown in Figure 1. The main components of the system are the Microprocessor Control Board (MCB) and the Serial LonTalk Adapter (SLTA). These components are mounted inside a standard NEMA 1 enclosure and interconnected by multi-conductor cables or discrete wiring. Power for the system is provided through transformers T1 and T2. Circuit breaker CB1, which provides overcurrent protection, can be used as an on-off switch for the panel.

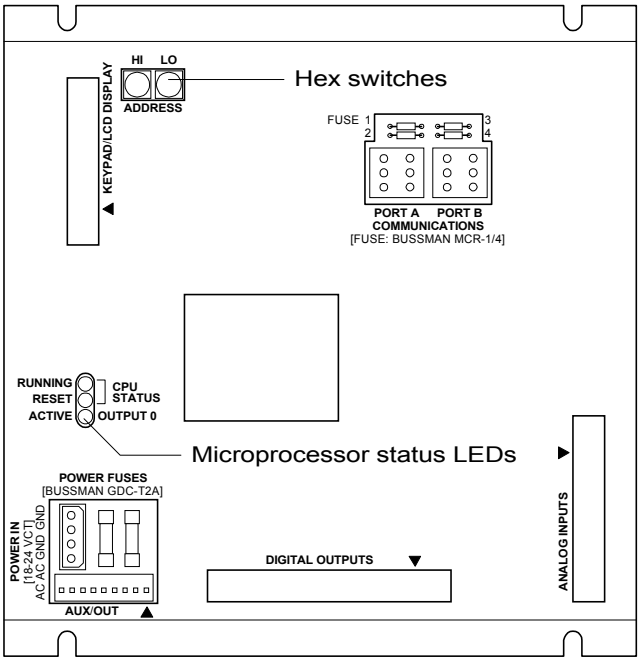
Figure 1. MCG Level-2 Control Panel Layout



Microprocessor Control Board

The Microprocessor Control Board (MCB) is shown in Figure 2. It contains a microprocessor that is programmed with the software required to receive, translate, and transmit data across the gateway in either direction. The various MCB connections and components are described below.

Figure 2. Microprocessor Control Board (MCB)



Aux/Out Terminal Strip

The Aux/Out terminal strip provides 12 Vdc power to the SLTA. Refer to the panel's wiring diagram (Figure 33 or Figure 34) for more information.

Power In Terminal Strip

The MCB receives 18 Vac, center-tapped power from transformer T2 through the Power In terminal strip. This power drives all logic and communications circuitry and the Aux/Out terminal strip. Refer to the panel's wiring diagram (Figure 33 or Figure 34) for more information.

Power Fuses

Two identical 2 A fuses are located to the right of the Power In terminal strip. These fuses are in the MCB power supply circuit.

Microprocessor Status LEDs

The green, red, and amber LEDs on the MCB provide information about the operating status of the microprocessor.

Following is the normal start-up sequence that the three status LEDs should follow when power is applied to the MCB:

1. The red ("Reset") LED turns on and remains on for approximately 5 seconds. During this period, the MCB performs a self-test.
2. The red LED turns off and the green ("Running") LED turns on. This indicates that the microprocessor has passed the self-test and is functioning properly.
3. The amber ("Active") LED starts flashing, indicating that the MCG's program is active.

For more information, refer to the "Test Procedures" section, which is under "Service Information."

If the above sequence does not occur after power is applied to the controller, there is a problem with the MCB or its power supply.

Table 3 and Table 4 summarize the green, red, and amber status LED indications.

Table 3. Green and Red Status LED Indication

Green LED State	Red LED State	Indication
Off	Off	No power to MCB
Off	On*	Self-test failure or power supply problem
On	Off	MCB operating normally

* For longer than 5 seconds.

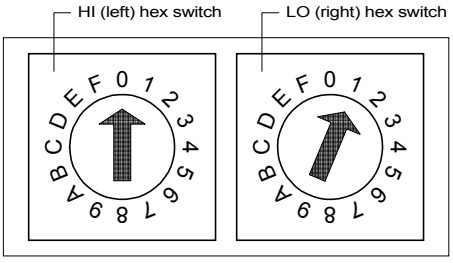
Table 4. Amber Status LED Indication (Green LED On)

Amber LED State	Indication
Flashing (On 1 sec, Off 1 sec)	Normal operation
Off	Program inactive (checksums corrupt)

Hex Switches

The MCB includes two hex (hexadecimal) switches that are used to set the MCG controller's network address.

Figure 3. Hex Switches



The HI and LO hex switches are shown in Figure 3. A "hex switch setting" is defined as the HI switch digit followed by the LO switch digit. For example, a hex switch setting of 2F would have the HI switch set to "2" and the LO switch set to "F."

Note: You can change the setting of a hex switch with a slotted-blade screwdriver that has a $^{3}/_{32}$-inch tip. If a hex switch setting is changed, power to the MCB must be cycled in order to enter the new setting into memory. This can be done by opening and then closing the push button circuit breaker (CB1) in the panel.

Communication Ports

The MCB has two communication ports: port A and port B. Each port has six terminals and is set up for both the RS-232C and RS-485 data transmission interface standards. Socketed fuses located next to the ports protect the communications drivers from voltage in excess of 12 V. Following are brief descriptions of each port's function in the two MCG configurations.

Port A in "MCG-L2": Port A is for communications with the SLTA using the RS-232C interface standard. The communications rate is 19200 bps.

Port B in "MCG-L2": Port B is for MicroTech network communications using the RS-485 interface standard. The communications rate is 9600 bps.

Port A in "MCG-OP": Port A is for communications with (1) a PC using the RS-232C interface standard or (2) a third-party building automation system using Open Protocol and either the RS-232C or the RS-485 interface standard. The communications rate is 9600 bps.

Port B in "MCG-OP": Port B is for communications with the SLTA using the RS-232C interface standard. The communications rate is 19200 bps.

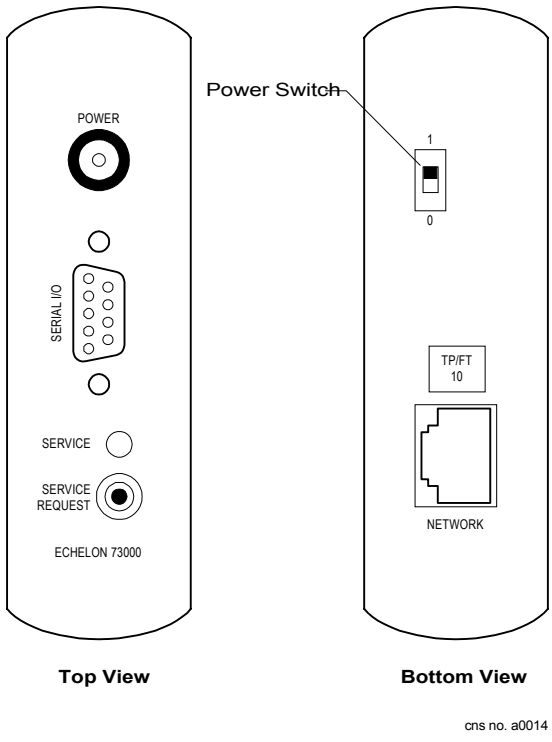
Serial LonTalk Adapter

The Serial LonTalk Adapter (SLTA) is shown in Figure 4. Manufactured by Echelon® (and called "SLTA/2" by them), it contains a Neuron® chip and firmware that performs most of the translation to and from the LonTalk protocol. The SLTA used by McQuay International contains an FTT-10 (free topology) transceiver.

The LonWorks network connects to the SLTA at the "Network" port by means of an 8-pin, RJ-45 connector. The communications port on the MCB connects to the SLTA at the "Serial I/O" port by means of a DB-9 connector. (Both connectors are included in the MCG.)

The SLTA receives its power from a power supply in the MCB. Note that the SLTA has a power switch, which should always be left in the on ("1") position.

Figure 4. Serial LonTalk Adapter (SLTA)



Software ID

MicroTech MCG software is factory installed and tested in each panel prior to shipment. The software is identified by a program code (also referred to as the "Ident"), which is printed on a small label affixed to the MCB. An example of this label is shown in Figure 5. The program code is also encoded in the controller's memory and is available for display on a PC equipped with Monitor software. Using Monitor software is the most reliable way of determining the controller's program code.

MCG program codification is as follows:

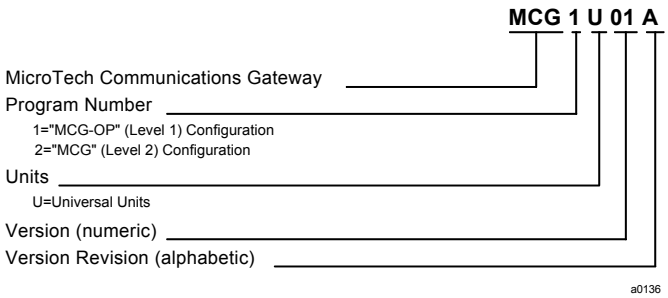
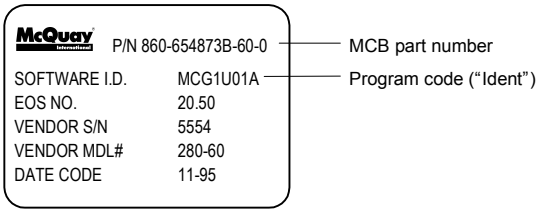


Figure 5. Example of a Software ID Tag



This edition of this manual documents revision N of the standard MCG software and subsequent revisions of version 01 until otherwise indicated. If your MCG software has a later revision code (for example, MCG1U01T), some of the details in this manual may not apply. However, since only very minor software changes are considered revisions, any differences should be insignificant.

Software Compatibility

This release of MCG software allows systems using the MicroTech proprietary protocol to communicate with the MicroTech 2000 family of LonWorks-based water source heat pump controllers.

The current software compatibility for standard MCG software is summarized in Table 5. The wildcard character (∗) can be any letter.

If you have a version of MicroTech 2000 unit controller software that is later than the compatible programs shown in Table 5, it is likely that program MCG∗U01∗ is compatible with it; however, it may not be. To find out for sure, contact McQuayService.

*Table 5. Program Code MCG*U01N Software Compatibility*

Unit Type	Compatible MicroTech 2000 Programs	Incompatible MicroTech 2000 Programs
HP	WHPE1D	none

Note: The MCG cannot be used with LonMark compatible MicroTech 2000 HP controllers.

Applying the MicroTech Communications Gateway

Networks that include both MicroTech 2000 and MicroTech controls require a MicroTech Communications Gateway. The MCG translates between the proprietary MicroTech network protocol and LonTalk, the protocol of MicroTech 2000 unit controllers. Devices using the MicroTech protocol include (1) unit and auxiliary controllers in the MicroTech family, (2) PCs equipped with MicroTech Monitor software, and (3) building automation systems by other manufacturers using Open Protocol.

(The term MCG is used to refer to MicroTech Communication Gateways in general when the particular application or variation is not important.)

McQuay International produces two variations of the MCG. One is a level-1 controller (referred to as an MCG-OP), and the other is a level-2 controller (referred to as an MCG-L2). The MCG-OP is the Open Protocol interface between a BAS network of an Open Protocol partner and MicroTech 2000 unit controllers. The MCG-L2 is used in both MicroTech BAS and Open Protocol networks. It is the interface between the level-1 MicroTech controller and MicroTech 2000 unit controllers.

Open Protocol networks require only one MCG, either an MCG-OP or an MCG-L2. This MCG handles all gateway functions. MicroTech BAS networks require two MCG-L2s. The gateway functions are shared between two configurations of the MCG-L2. The one configured as an MCG-Monitor handles all read and write requests from the Monitor program (This function is similar to the Open Protocol function of the MCG-OP). The other configured as the MCG-LMP handles all network read and write requests from the MicroTech level-1 controller. You specify the configuration for each in the MicroTech Monitor for Windows program.

See Figure 6 through Figure 9 for typical applications in which MicroTech 2000 products are used. The table contains a legend for the figures.

Symbol	Description
BAS	Building automation system
HP	Water source heat pump
LWC	Loop Water Controller
OPM	Open Protocol Master
ART	Applied rooftop unit
LMP	Local Master Panel
NMP	Network Master Panel
———	MicroTech network wiring
- - - - - - - - - -	MicroTech 2000 (LonWorks FTT-10) network wiring

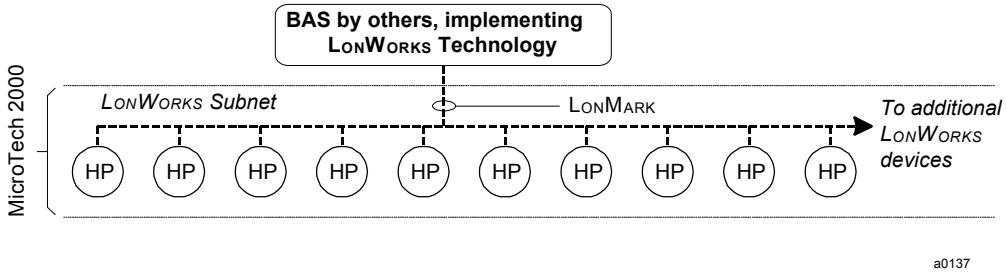
Interoperable Systems

Figure 6 through Figure 8 shows typical *interoperable* system applications. In these applications, MicroTech 2000 controllers are integrated into a third-party BAS, which includes a human-machine interface such as a PC. The systems are interoperable because the McQuay International equipment and the BAS are able to communicate through a common protocol.

Pure LonWorks

In Figure 6, which shows the ideal interoperable system, the third-party BAS is capable of implementing LonWorks technology. Because the BAS uses LonWorks, the communications protocol is LonTalk, and thus the MCG is *not required*.

Figure 6. Typical Interoperable System Using LonTalk Interface



No MCG Required: LonTalk and LonMark™

In Figure 6, which shows the ideal interoperable system, the third party BAS is capable of implementing LonWorks technology, and the MicroTech 2000 products are LonMark certified. Because the BAS uses LonWorks, the communications protocol is LonTalk, and thus the MCG cannot be used. LonMark-certified products conform to interoperability standards that are increasingly being accepted and used throughout the HVAC industry. These standards define the minimum requirements for the variables passed over the network (e.g., supply air temperature for a heat pump) and their formats (e.g., units of degrees Celsius). The common LonTalk protocol allows the different products to "speak the same language"; the LonMark standards allow different products to "know what to say to each other" with a minimum amount of systems-integration effort.

Note: LonMark-certified MicroTech 2000 products are not yet available. The software for the MicroTech 2000 water source heat pump is *not* LonMark-certified.

Open Protocol: MicroTech 2000 Only

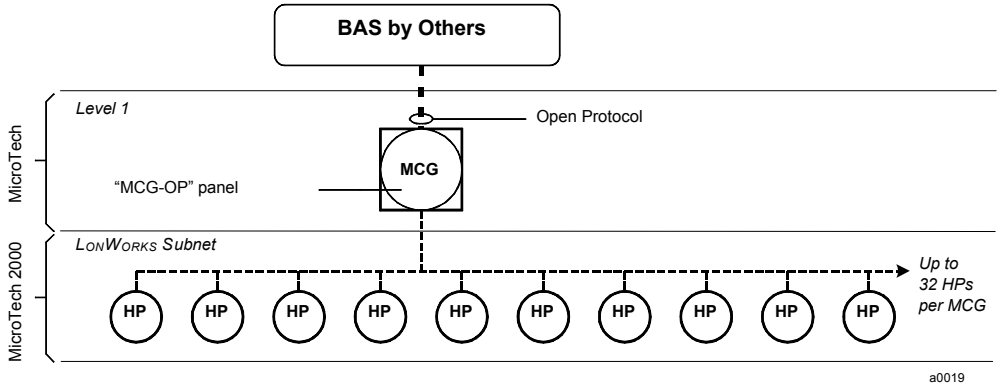
Figure 7 shows an interoperable system in which the third-party BAS is communicating with MicroTech 2000 controllers through a single connection. Because the BAS in this application is not capable of implementing LonWorks technology, the MCG and Open Protocol are required. The "MCG-OP" controller is used since the MCG is substituting for an OPM.

In an Open Protocol environment, the refresh rate for each point accessed through an MCG depends on the total number of points polled. Each MCG can communicate with a maximum of 64 controllers. Temperature control companies should set limits on how many controllers are connected to each MCG and how many points each controller polls. In general, no more than 32 controllers should be connected to an MCG and each controller should poll no more than 20 points. This gives acceptable refresh rates for most systems. However, you may want to reduce the number of controllers or the number of points to achieve the refresh rate you want.

See "Open Protocol: MicroTech and MicroTech 2000 Mix".

If other unit or auxiliary controllers in the MicroTech family are integrated into the system, a separate connection from the BAS is required for each MicroTech controller.

Figure 7. Typical Interoperable System Using Open Protocol Interface to MicroTech 2000 Equipment Only

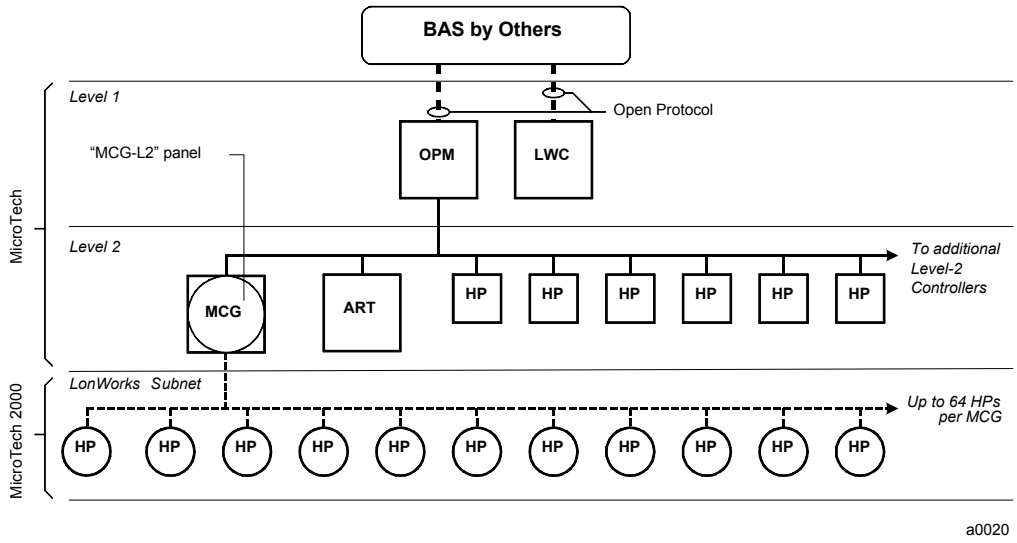


Open Protocol: MicroTech and MicroTech 2000 Mix

Figure 8 shows an interoperable system in which the third-party BAS is communicating with a mixture of MicroTech and MicroTech 2000 products through a single connection. The OPM is required because the BAS is communicating with more than one MicroTech product through a single connection. (The MCG is considered a MicroTech product.) The MCG is required because the BAS in this application cannot implement LonWorks technology. The "MCG-L2" panel is used here since the MCG is not substituting for an OPM. For best performance, connect no more than 32 MicroTech 2000 controllers to MCG-L2 and poll no more than 20 information points per controller.

Note: The LWC in Figure 8 is shown integrated via a separate BAS connection because quicker response times result. Though not recommended, it is also possible to use the LWC as a level-2 slave to the OPM. The BAS is responsible for all communications between the LWC and the MCG.

Figure 8. Typical Interoperable System Using Open Protocol Interface to MicroTech and MicroTech 2000 Equipment



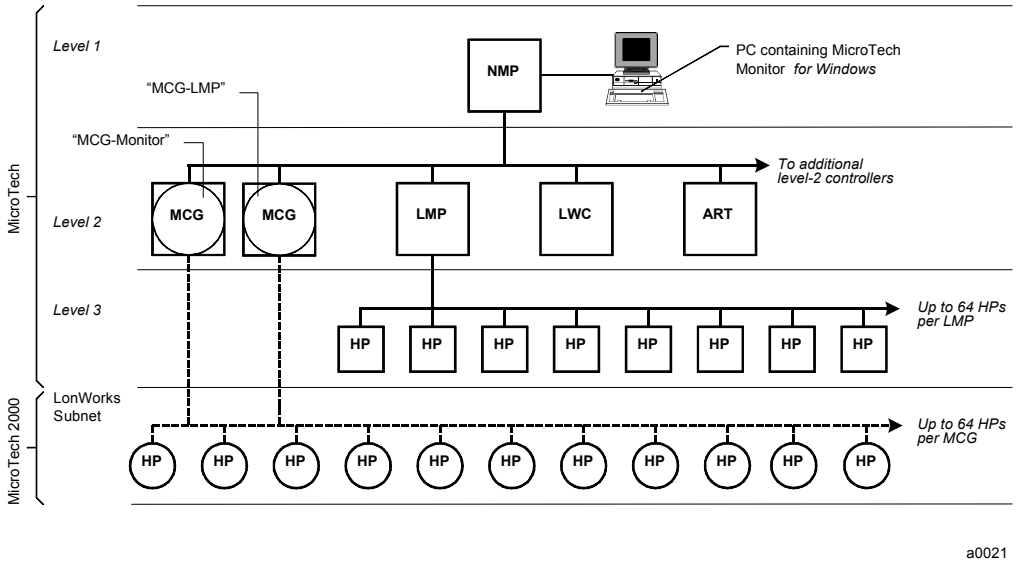
MicroTech BAS

Figure 9 shows a typical MicroTech BAS application with a mixture of MicroTech and MicroTech 2000 products. In these applications, MicroTech 2000 controllers are integrated into a MicroTech BAS, which includes a PC equipped with MicroTech Monitor™ for Windows software. In the case of MicroTech 2000 controllers for water source heat pumps, the MCG effectively substitutes for a Local Master Controller (LMC), which is included in LMPs and some NMPs.

For defintions of MCG terms, see "Applying the MicroTech Communications Gateway."

Network functions are shared between two MCGs. One configured as the "MCG-Monitor " controls read and write requests from the PC to the MicroTech 2000 unit controllers. The other configured as the "MCG-LMP" controls alarms, network read and write requests, and time schedules sent to the MicroTech 2000 unit controllers from the NMP. Both MCGs are required and must be connected to the LonWorks subnet.

Figure 9. Typical MicroTech-Only System with MicroTech and MicroTech 2000 Equipment



Network Architecture

Any network that includes an MCG contains two types of network architecture: MicroTech, which is a master-slave type, and MicroTech 2000 (LonWorks), which is a peer-to-peer type. The MCG is the gateway between the two network types.

MicroTech Family

All controllers in a MicroTech network are assigned a logical "level": level 1, level 2, or level 3. All MicroTech networks must have one (and only one) level-1 controller to coordinate communications. Multiple level-2 controllers can be connected to the level-1 controller with a communications trunk, an isolated section of the daisy-chained network. Multiple level-3 controllers can be connected to a level-2 controller with another trunk. For general information on wiring a MicroTech network, refer to the installation manual provided with the level-1 controller.

MicroTech 2000 Family

For information on wiring the subnet, see the "Field Wiring" section.

The network architecture that is currently used with the MCG and the MicroTech 2000 family of unit controllers is a simplified form of LonWorks architecture. The MCG and all MicroTech 2000 controllers connected to it are part of the same *subnet*. The SLTA and each MicroTech 2000 controller are *nodes* on the subnet. A node is any device that contains a Neuron chip

From the MicroTech side of the MCG, the MicroTech 2000 nodes appear as level-3 slaves. Thus the Open Protocol and MicroTech BAS functions in the NMP and PC operate the same way they do for MicroTech controllers.

Panel Location and Mounting

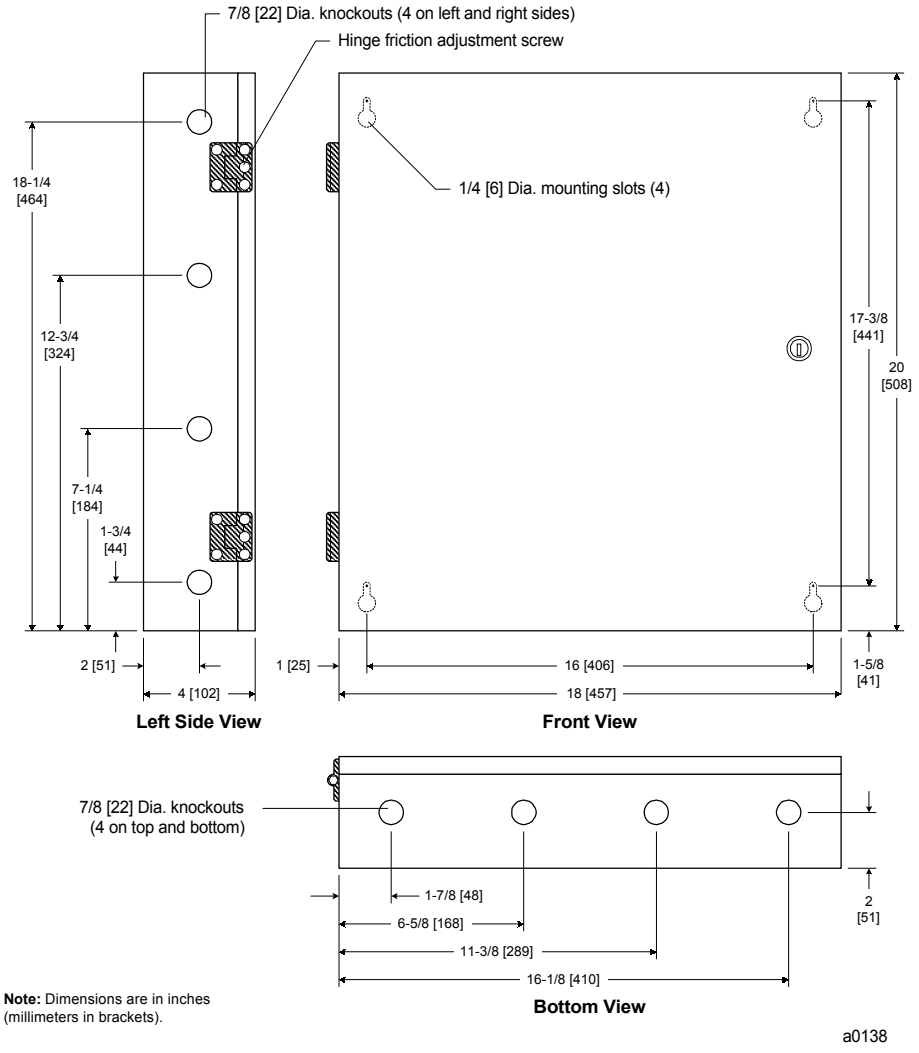
The MCG is suitable for indoor use only. Table 6 lists allowable temperature and humidity ranges. Locate the panel (or panels) at a convenient height, and allow adequate clearance for the door swing. Mount each panel to the wall with screws or bolts. It weighs approximately 50 pounds. The panel has four ¼-inch keyslot openings at the corners. Panel dimensions are shown in Figure 10.

The panel is equipped with special door hinges that have a friction adjustment screw. By adjusting this screw, you can prevent the door from swinging open or closed unexpectedly.

Table 6. MCG Panel Environmental Specifications

Panel State	Temperature	Relative Humidity
Operating	32 – 100°F (0 – 37°C)	25 – 95% (noncondensing)
In storage	–4 – 140°F (–20 – 60°C)	0 – 95% (noncondensing)

Figure 10. MCG Panel Dimensions



Field Wiring

Following are descriptions of the various field wiring requirements and options. All possible field-wiring connections are shown in Figure 13.

The panel is divided into high and low voltage sections by a sheet metal barrier. Pass power wires only into the high voltage section, and network wires only into the low voltage section. Wiring penetrations must be made only through the 7/8-inch knockouts provided.

Caution: Do not pass network wires through the high voltage section or high voltage wires through the low voltage section.

Note: Wiring must comply with the National Electrical Code and all local codes and ordinances. The warranty is void if the field wiring is not in accordance with these instructions.

Power

⚠ WARNING

Electric shock hazard.

Can cause personal injury or death.

This equipment must be properly grounded.

All protective deadfront panels must be reinstalled and secured when power wiring is complete.

The MCG panel requires 115 Vac power, which should be connected to terminals L1 and L2 in the high voltage section of the panel. The panel must be properly grounded by connecting the ground lug (GRD) to earth ground. Refer to Figure 13. Power wiring must be sized to carry at least 5 amps.

To gain access to the high voltage section, remove the deadfront barrier. It is attached to the panel with three 5/16-inch hex screws. Replace this deadfront when the wiring is complete.

The panel is internally protected with a 0.5 amp circuit breaker (CB1), which is located inside the panel on the underside of the high voltage section (see Figure 1). This push-button circuit breaker can also be used as an on-off switch for the panel. When the push button is in, the panel should be energized. When the push button is out, the panel should be de-energized. Note that a white ring on the switch shaft is visible when the push button is out.

Network Communications: MicroTech 2000 Side

See the "Cable Specification" section for cable details.

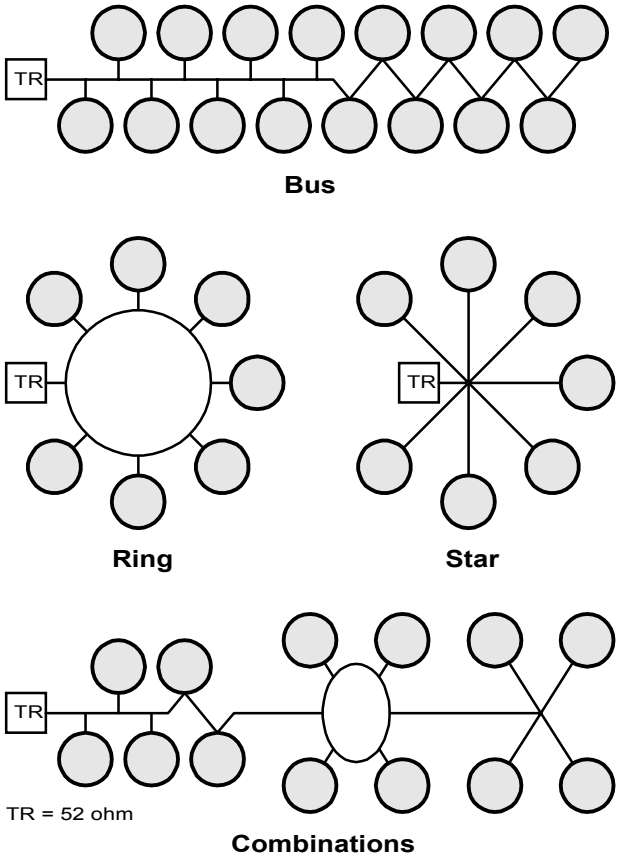
The MCG's SLTA and all MicroTech 2000 controllers are equipped with an FTT-10 transceiver for network communications. This transceiver allows for (1) *free topology* network wiring schemes using twisted pair (unshielded) cable and (2) polarity insensitive terminations at each node. This combination of features greatly simplifies installation and reduces network commissioning problems. It also allows nodes to be added in the future with little regard for existing cable routing. The communications rate on an FTT-10 network is 78 kbps.

As shown in Figure 11, free topology means that the following network topologies are possible:

- Bus
- Ring
- Star
- Any combination of Bus, Ring, and Star

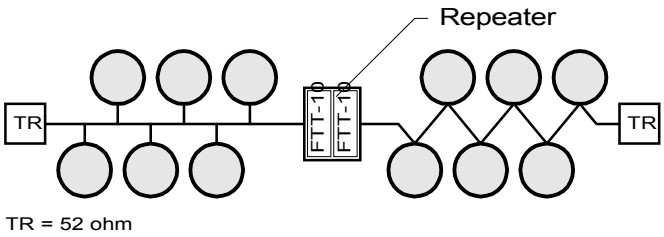
Note: Limitations to wire lengths apply and must be observed.

Figure 11. Free Topology Networks



A *network segment* is any part of the free topology network in which each conductor is electrically continuous. Each of the four diagrams in Figure 11 is a segment. Some applications may require two or more segments; see "Free Topology Restrictions" below. If necessary, segments can be joined with FTT-10-to-FTT-10 physical layer repeaters, which are available from third-party vendors. See Figure 12.

Figure 12. Combining Network Segments With a Repeater



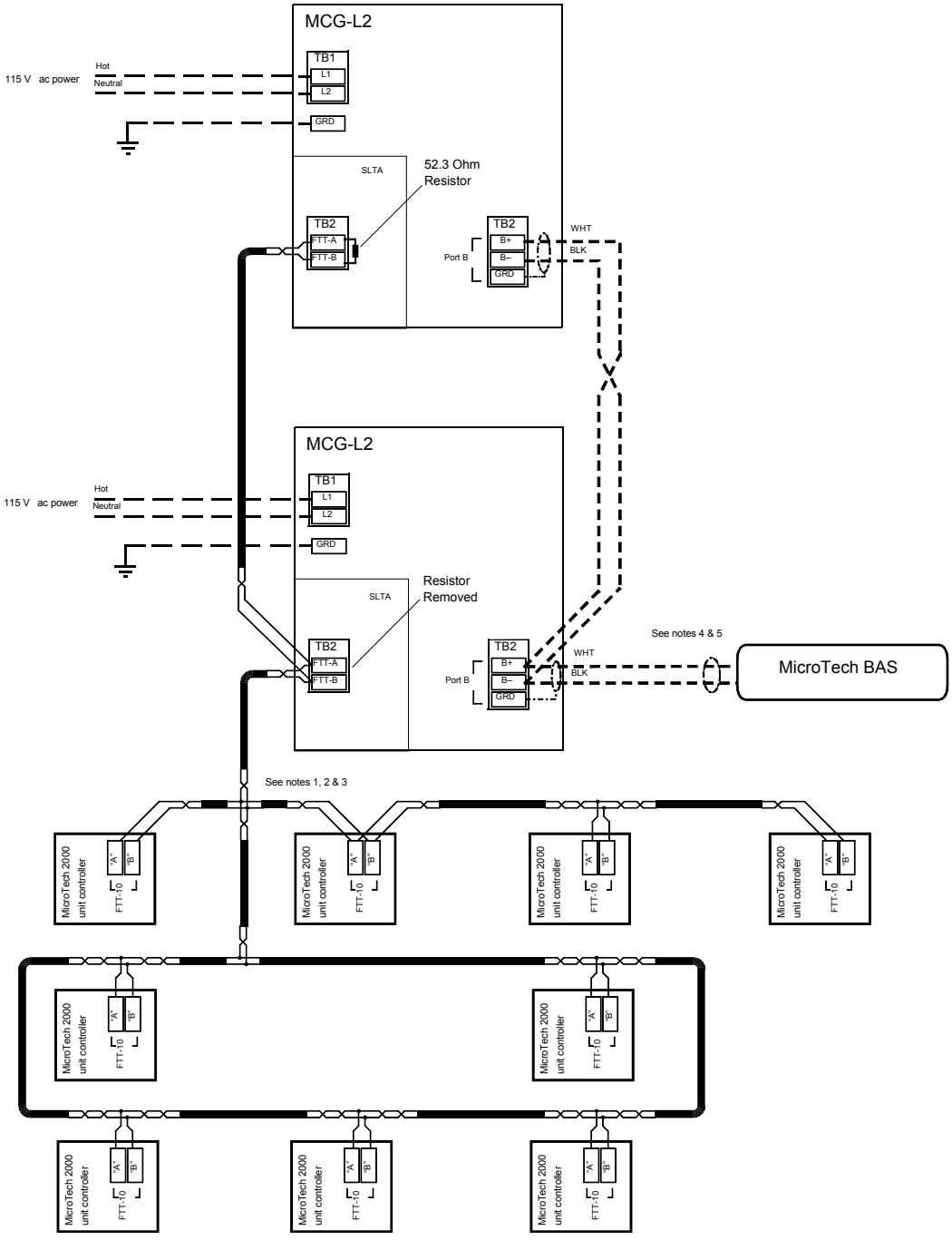
Free Topology Restrictions

Although free topology wiring is very flexible, there are restrictions:

1. The maximum number of nodes per segment is 64 (not including the SLTA).

   The maximum number of MicroTech 2000 controllers per MCG-L2 pair (MicroTech BAS) or per MCG-OP (Open Protocol: 32 is recommended maximum) is also 64. So when an MCG is being used, *this 64-unit limit cannot be increased by installing a repeater.*

Figure 13. Typical Field Wiring Diagram for MicroTech BAS (Free Topology Shown)



Notes:

1. MicroTech 2000 network communications terminations are polarity insensitive. Field terminals are as follows:

	FTT-10 field terminal	
MicroTech 2000 unit controller	**"A"**	**"B"**
Water source heat pump	TB1-5	TB1-6

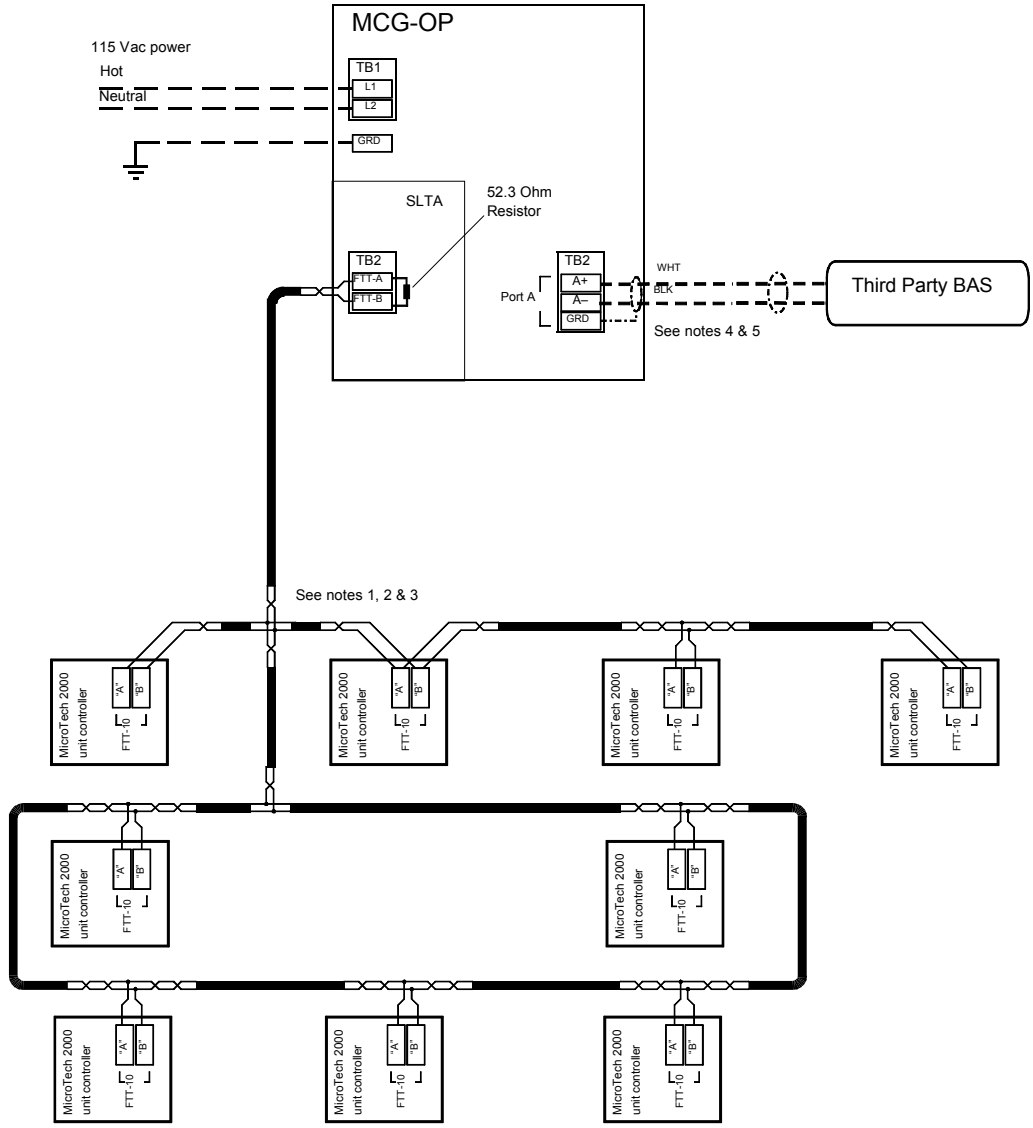
2. When making splices and multiple-wire terminations, always match wire color to reduce the risk of shorts. *This precaution is especially important when wiring ring topologies.*
3. Twisted pair cable for a MicroTech 2000 network must be NEMA "Level 4" or approved by Echelon (Connect-Air W221P-1002 [PVC], W221P-2001 [plenum], or equivalent). Maximum node-to-node distance is 1312 ft (400 m). Total cable length must not exceed 1640 ft (500 m).
4. Twisted, shielded pair cable must meet the following minimum requirements: 300 V, 60°C, 20 AWG, polyethylene insulated, with a PVC outer jacket and drain wire (Belden 8762 or equivalent). Some local codes may require the use of plenum rated cable.
5. Cable length must not exceed 5000 ft (1524 m).

Legend

- FTT-B — Field wiring terminal
- Field wiring: discrete
- Field wiring: twisted pair cable
- Field wiring: twisted, shielded pair cable with drain wire

a0023

Figure 14. Typical Field Wiring Schematic for Open Protocol System (Free Topology Shown)



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4. Twisted, shielded pair cable must meet the following minimum requirements: 300 V, 60°C, 20 AWG, polyethylene insulated, with a PVC outer jacket and drain wire (Belden 8762 or equivalent). Some local codes may require the use of plenum rated cable.
5. Cable length must not exceed 50 ft (1524 m).

Legend

- FTT-B — Field wiring terminal
- Field wiring: discrete
- Field wiring: twisted pair cable
- Field wiring: twisted, shielded pair cable with drain wire

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2. The maximum node-to-node distance is 1312 ft (400 m).

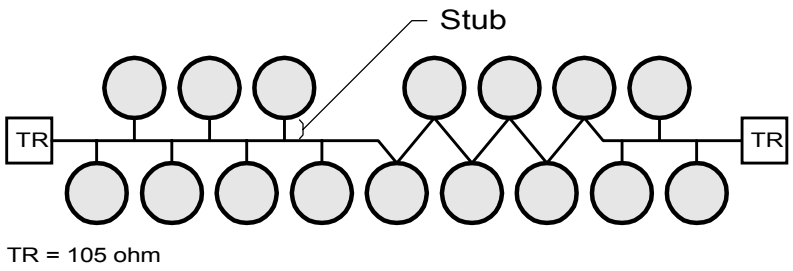
   The longest cable path between any possible pair of nodes on a segment must not exceed the *maximum* node-*to-node distance*. If two or more paths exist between a pair of nodes (e.g., a loop topology), the longest path should be considered. Note that in a bus topology, the longest node-to-node distance is equal to the total cable length.

3. The maximum total cable length is 1640 ft (500 m).
   a. The total length of all cable in a segment must not exceed the maximum total cable length.
   b. One 52.3-ohm (0.25 W, 1%) termination resistor is required in each segment.
   c. A termination resistor is factory installed in the MCG across terminals FTT-A and FTT-B, so in most cases, you don't need to worry about this requirement.
   d. If you install a repeater and another segment, you must obtain and install a termination resistor in that segment. The termination resistor can be located anywhere in the segment.
   e. When you install more than one MCG on the same segment (MicroTech BAS networks), you must remove the resistors from one MCG.

Extending Cable Length with Special Bus Topology

You can extend the maximum total cable length without using a repeater by using *doubly-terminated bus topology* instead of free topology. See Figure 15. The trade-offs are (1) this special *bus* topology must be rigorously followed during the installation and subsequent retrofits and (2) two termination resistors must be installed at the ends of the bus.

Figure 15. Doubly-Terminated Bus Topology Network



The restrictions on doubly-terminated bus topology are as follows:

1. The maximum number of nodes per segment is 64 (not including SLTA).
2. The maximum total bus length depends on the wire size (see "Cable Specification" for details):

Wire Size	Maximum Cable Length
22 AWG	4590 ft (1400 m)
16 AWG	8855 ft (2700 m)

3. The maximum stub length is 9.8 ft (3 m).

   A *stub* is a piece of cable that is wired between the node and the bus. See Figure 15. Note that if the bus is wired directly to the node, there is no stub, and thus the stub length is zero. If you are wiring to a field terminal strip on a unit (e.g., HP), be sure to account for any factory wiring between the terminal strip and the MicroTech 2000 controller. This wiring is considered part of the stub.
4. Two 105-ohm (0.25 W, 1%) termination resistors are required in each segment. One resistor must be located at each end of the bus.

   Note that the 52-ohm resistor in the MCG, which is factory installed across terminals FTT-A and FTT-B, must be removed. If the bus includes two MCGs, the resistor in each MCG must be removed.

Cable Specification

The twisted-pair network communications cable for MicroTech 2000 (LonWorks FTT-10) networks must (1) be approved by Echelon or (2) meet the "Level 4" cable specification for 22 AWG (0.65 mm) wire, which was originally defined by NEMA. Some local codes or applications may require the use of plenum rated cable. The following cables meet this specification:

Vendor	Part no.	Wire size & type
Connect-Air International (Phone: 206-813-5599)	W221P-1002 W221P-2001	22 AWG, PVC 22 AWG, plenum
Belden (Phone: 317-983-5200)	8471 85102	16 AWG, PVC 16 AWG, plenum

Do not install the cable in the same conduit with power wiring. The temperature of the cable must not exceed 131°F (55°C).

Note: Ideally, one continuous piece of cable should connect any two controllers. This reduces the risk of communications errors. If the cable must be spliced, use crimp-type butt connectors (good) or solder (best). Do not use wire nuts.

Wiring Instructions

Wiring a MicroTech 2000 network is simplified by the following:

1. Free topology may be used.
2. Only two terminations are required at each node.
3. Those terminations may be made without regard for polarity.
4. If you use two MCGs, connect them together in parallel and remove the terminating resistor from one of them.

MicroTech 2000 controllers are equipped with field terminals for the network communications terminations, which are summarized in Table 7. (Internal factory wiring connects the node to the field terminals.)

Table 7. Network Communications Field Wiring Terminals

MicroTech 2000 Controller	Terminal "A"	Terminal "B"
MCG	FTT-A on TB2	FTT-B on TB2
HP	5 on TB1	6 on TB1

Network wiring is completely independent from controller addressing. Therefore, the networked controllers can be wired in any order. Thus an electrician can wire the network and a technician—who has no knowledge of the wiring—can address the controllers later, during the commissioning process.

Use the following guidelines as you wire the network:

- Before beginning, unplug the RJ-45 connector from the "Network" port on the SLTA in the MCG.
- Observe the topology restrictions described above.
- Use care to assure that no shorts or opens exist in the network.
- Make certain to connect to the proper terminals on the HP.

Note: Voltages are present on some field wiring terminals of the HP. If the communications wire is connected to the wrong terminals, it can destroy the communications components of all controllers connected to the communications wire. These boards are not replaced under warranty.

The resistance across the conductors from the termination resistor(s) should be approximately 52 ohms, *but this resistance appears on an ohmmeter only when all nodes are disconnected from the network cable.* This is true because the impedance across an unpowered FTT-10 transceiver is approximately 6 ohms. Because disconnecting all nodes may be a difficult and time consuming task, we recommend not doing it unless communications problems are discovered during the commissioning process.

- When making wire splices and multiple-wire terminations, always match wire color to reduce the risk of shorts. *This precaution is especially important when wiring ring topologies.*
- Though free topology allows for very flexible, ad hoc wiring, *it is recommended that the installing contractor record the physical locations of the cable runs and the controllers on a floor plan*. This facilitates troubleshooting any network communications problems that may occur during installation or in the future.
- By looking at the internal factory wiring, assure that each node (except SLTA) is connected to the network. The connection at a MicroTech 2000 controller is typically an "insulation-displacement" type (IDC) plug-in connector. These connectors should be connected to their controllers. Since controller addressing can be done remotely, this eliminates the need for a technician to return to each unit during the commissioning process.

Note: This guideline is the opposite of what is recommended for a MicroTech network.

Network Communications: MicroTech Side

See the "Cable Specifications" section for details.

MCG-L2 panels" (level-2) require network communications wiring on the MicroTech side of the gateway. As shown on the panel wiring diagram, the twisted, shielded cable should be wired to terminals B+, B–, and GND on terminal block TB2. For more information on wiring the MicroTech side of the network, see the installation manual that was supplied with the level-1 controller; for example, the MicroTech Network Master Panel (NMP) or Open Protocol Master (OPM).

Note: Network communications wiring requirements for MicroTech 2000 networks are very different from those for MicroTech networks. For example, in a MicroTech network, free topology does not apply (a bus topology must be used), and twisted pair, unshielded cable cannot be used.

Network Commissioning

This section discusses network commissioning for MicroTech 2000 networks in which there is an MCG. It does not discuss the commissioning of a MicroTech network. For information on that, refer to the installation manual supplied with the level-1 controller (e.g., NMP, OPM, or CSC).

The purpose of commissioning a MicroTech 2000 network is to establish and verify communications between the MCG and its associated unit controllers. (It is not to establish and verify unit *operation*.) Network commissioning should be done after unit check test and start procedures have been completed.

⚠ NOTICE

Before any unit is allowed to operate, it must be commissioned in accordance with the instructions in the MicroTech unit controller installation literature (see Table 1) and the model-specific unit installation literature. In addition, the MCG must be set up so that it can perform the proper data translation for its associated units. This setup is described below in "Overview of Procedure."

Network Management

In addition to performing protocol translation, the MCG serves as a *network management tool*, which holds the *network database*. A network management tool allows you to configure a LonWorks network. When you configure a MicroTech 2000 network, you simultaneously address the controllers and set up the network database. A network database simply contains information about the network's configuration. In the MCG, this is essentially a table that lists each MicroTech 2000 controller and its logical address (see Figure 18).

MicroTech 2000 controllers are assigned logical addresses by the network management tool; there are no hex switches as there are on MicroTech controllers. Since the network management tool communicates over the network, you can perform addressing and commissioning at the same time.

In conjunction with a PC equipped with the appropriate Monitor software, the MCG provides the following network management tool features:

- Automatic node installation (addressing)
- Manual node installation (addressing)
- Automatic address conflict resolution
- Service pin message acknowledgment
- Wink

These features are described below in "Node Installation."

There are other network management tools available; for example, a PC equipped with a PCLTA card and LonMaker™ software. If you want, you can use one of the other tools instead of the MCG. (In this case, the MCG must still be set up so that proper data translation occurs.

Required Tools

To commission the network, you need the following tools:

1. Voltmeter
2. Ohmmeter
3. PC equipped with Monitor software for the MCG
4. Cable to connect the PC to a MicroTech controller

For more information on the PC and the cable, see "PC Access" below.

About the Network Address

For network communications to occur, each controller in the network must have a unique network address. The network address has two parts: subnet address and node address. Each part is a two-digit hexadecimal number. For example, a unit at address 01.0F has a subnet address of 01(hexadecimal) and a node address of 0F(hexadecimal) (decimal 15). The first digit in each part is called the HI digit, and the second digit is called the LO digit. Thus for the node address 0F(hexadecimal), the HI digit is "0" and the LO digit is "F." Table 8 is a hexadecimal to decimal conversion guide.

Figure 16. MicroTech 2000 Network Address

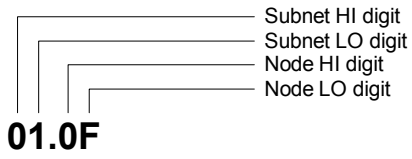


Table 8. Hexadecimal to Decimal Conversion Guide

Hex	Dec	Hex	Dec	Hex	Dec	Hex	Dec
01	1	11	17	21	33	31	49
02	2	12	18	22	34	32	50
03	3	13	19	23	35	33	51
04	4	14	20	24	36	34	52
05	5	15	21	25	37	35	53
06	6	16	22	26	38	36	54
07	7	17	23	27	39	37	55
08	8	18	24	28	40	38	56
09	9	19	25	29	41	39	57
0A	10	1A	26	2A	42	3A	58
0B	11	1B	27	2B	43	3B	59
0C	12	1C	28	2C	44	3C	60
0D	13	1D	29	2D	45	3D	61
0E	14	1E	30	2E	46	3E	62
0F	15	1F	31	2F	47	3F	63
10	16	20	32	30	48	40	64

After the subnet address is set in the MCG, the MCG automatically assigns it to each of its associated nodes during the node installation.

In most cases, the node address and its associated controller is defined and documented on a schedule before network commissioning begins. The system engineer should keep in mind the following rules when doing this:

- The node addresses of MicroTech 2000 HP controllers must start at 01 and continue consecutively.
- In a MicroTech BAS network, the maximum number of nodes is 40(hexadecimal) (decimal 64) for each MCG pair.
- In an Open Protocol network, no more than 20(hexadecimal) (32 decimal) nodes should be polled for each MCG.
- There must be no gaps in the sequence and no duplicate settings.

Overview of Procedure

1. Assure that all units have been through the factory specified check, test, and start procedure.

   If an HP has not been through this procedure, it should not be powered up because mechanical damage may occur. Since units must be powered during network commissioning, do the check, test, and start procedure on all HPs prior to the network commissioning.
2. Verify the network wiring.

   Check that the network wiring was done according to the instructions in “Field Wiring”. All MicroTech 2000 controllers are connected to the network cable, and all units have power.

   If this is MicroTech BAS network, verify that the factory-installed resistor across FTT-A and FTT-B has been removed from one of the MCGs.
3. Use a voltmeter to check for stray voltage on the network.
   a. At the MCG, place one lead on the control panel chassis (ground), and check the voltage at the FTT-A and FTT-B field terminals. There should be no voltage.
   b. If there is, check the network wiring for sources of stray voltage.
4. Connect the PC and start the Monitor program.

For basic information on how to load and use the Monitor program, see the user's manual that was supplied with it.

A PC is required to set up the MCG and do some of the optional network management methods. The connection point depends on the application. See "PC Access" below for information.

5. At the MCG, plug the RJ-45 connector into the Network port on the SLTA.
6. Set the subnet address at the MCG.

   The way the subnet address is set depends on the MCG's configuration. After you have set the subnet address, *you must reset the MCB.* (This reconfigures the SLTA.) You can reset the MCB by (1) cycling power to the panel or (2) changing the Soft Reset? variable to "Reset."

For defintions of MCG terms, see "Applying the MicroTech Communications Gateway."

"MCG-L2"

In a MicroTech BAS network, each HP communications bus must be connected to two MCGs. One MCG is configured as an MCG-Monitor and the second is configured as an MCG-LMP. These two MCGs serve different communications functions, and both must be present and active for reliable network communications. The subnet address (which is a LonWorks address) must be the same for both, but each MicroTech network address must be different. The hex switches on the two MCGs must be set to different values.

The LonWorks subnet address is determined by the hex switch value of the MCG-Monitor. Therefore, the LonWorks subnet address for all HPs and the MicroTech network level-2 address of the MCG-Monitor are the same. For example, if a the hex switch setting is 02, its MicroTech network address is 02.00 and its MicroTech 2000 subnet address is 02. The MCG-Monitors hex switches should have been set when the MicroTech network was commissioned.

The MCG-LMP has different LonWorks subnet and MicroTech network addresses. The LonWorks subnet address of the MCG-LMP is determined by its Subnet Address variable which is set by using the Monitor program and should match the subnet address of the MCG-Monitor. For more information, see "MCG Setup Variables" below. The MicroTech network address of the MCG-LMP is set by using the hex switches, and should have been done during the MicroTech network commissioning.

"MCG-OP"

The subnet address is set in the MCG's Subnet Address variable, which is set with the Monitor program. Unlike all other MicroTech controllers, the hex switches on the MCG-OP are ignored (unless they are set to FF). No matter what value the hex switches are set to, the MicroTech network address of the MCG-OP is 00.00. In most cases, the default subnet address 01 need not be altered. For more information, see "MCG Setup Variables".

7. Set up the MCG. Use the Monitor program to set the following variables in the MCG:
   a. Gateway Configuration (MCG Setup screen)
   b. Number Of Controllers (MCG Setup screen)
   c. Node x Location Description, where x is the node address (Network Database screen)

   Note: The Node Location Description variables are for documentation purposes only. Setting them is optional.

   Do not set the Unit Type variables yet; they are set after the controller addresses are assigned.

For more information on these and other MCG variables, see "MCG Setup Variables" below.

8. Verify that the Serial LonTalk Adapter Status variable shows "OK–Configured." If it does not, see "Troubleshooting the SLTA" in the "Test Procedures" section.
9. For each MicroTech 2000 controller, (1) assign an address, (2) verify communications, and (3) verify the address.

   These three tasks are collectively called "installing a node." There are four ways to install a node:

See "Node Installation" below for detailed information on each method.

a. Auto-Install: Specific method
b. Auto-Install: Incremental method
c. Manual-Install: Remote/Local method
d. Manual-Install: Remote method (readdress only)

See the "Using the MicroTech Wall Sensor" section below for more information.

In most cases, node installation involves using the tenant override button and Status LED at each unit's wall sensor.

10. Set the Unit Type variables in the MCG. This step can be done for each node after it is installed or after all the nodes are installed.

    The Unit Type variables tell the MCG how to interpret and route data going to or coming from the unit controllers.

    Water source heat pumps are manufacture in four types:

CCH	Ceiling hung	Single compressor and dual compressor
FCV	Small vertical	Single compressor only
WM	Console units	Single compressor only
LHP	Large vertical	Single compressor and dual compressor

    Set the Unit Type variables according to the following guidelines:

Unit Type setting	Guidelines
WSHP	FCV
	WM
	CCH, Single compressor units only
LHP	CCH, Dual compressor units only
	LHP, Single and dual compressor units

Note: The node installation process automatically changes the Unit Type variable from "N/A" to the default setting, "WSHP." Be sure to change it to LHP if necessary.

11. For MicroTech BAS applications, set up the slave list in the NMP.

    For MicroTech 2000 HP controllers, the MCG-LMP is emulating a MicroTech Local Master Controller. Therefore, the MCG-LMP should be designated as "WSLMP" in the NMP's slave list and its Alarm Address variable should be set equal to the MicroTech network level-2 address of the associated MCG-Monitor. The MCG-Monitor is used only for Monitor communications and should be declared as "N/A" in the NMP's slave list. Its alarm address variable is not used and may be left at its default value.

PC Access

See the "Applying the MCG" section for more information.

During the network commissioning process, PC access to the MCG controller is required. The connection point for the PC and the form of Monitor software supplied depends on the application. The following table summarizes these situations:

Application	MCG Panel config.	Monitor software	PC connection at
Open Protocol: MicroTech 2000 only (Figure 7)	MCG-OP	Standard Open Protocol (DOS based)	Port A on MCG
Open Protocol: MicroTech and MicroTech 2000 mix (Figure 8)	MCG	Standard Open Protocol (DOS based)	Port A on OPM
MicroTech BAS (Figure 9)	2 MCGs (MCG-Monitor and MCG-LMP)	Custom (Windows based)	Port A on NMP

For the two Open Protocol applications, the PC is connected only during the commissioning process. It is typically a laptop (see Table 9 for specifications). For the MicroTech BAS application, the PC is usually the permanent on-site PC. However, it could also be a laptop temporarily connected to the level-1 controller or another level-2 controller. Note that you can connect directly to the "MCG-OP" panel, but you cannot connect directly to the "MCG-L2" panel.

Table 9. PC Specification for Network Commissioning

Preferred Configuration	Minimum Configuration
Pentium processor	386SX processor
8 MB of RAM or better	4 MB of RAM
3½" floppy disk drive	3½" floppy disk drive
Serial port (9 pin male; Com1 or Com2)	Serial port (9 or 25 pin male; Com1 or Com2)
Super VGA graphics capability	VGA graphics capability
Bus mouse or trackball *(for Windows-based Monitor only)*	Serial mouse or trackball* *(for Windows-based Monitor only)*
MS-DOS® 6.2	MS-DOS® 5.0
Microsoft® Windows® 3.1 *(for Windows-based Monitor only)*	Microsoft® Windows® 3.1 *(for Windows-based Monitor only)*
MicroTech® Monitor™ software for MCG	MicroTech® Monitor™ software for MCG

* If a serial pointing device is used, there must be another serial port (Com1 or Com2) available for connecting the PC to the MicroTech controller.

The MCG's Monitor software is available in two forms: DOS based and Windows based. The DOS version is part of the standard Monitor software package for Open Protocol commissioning. The Windows version is included in Monitor software packages that are custom made for MicroTech-BAS applications.

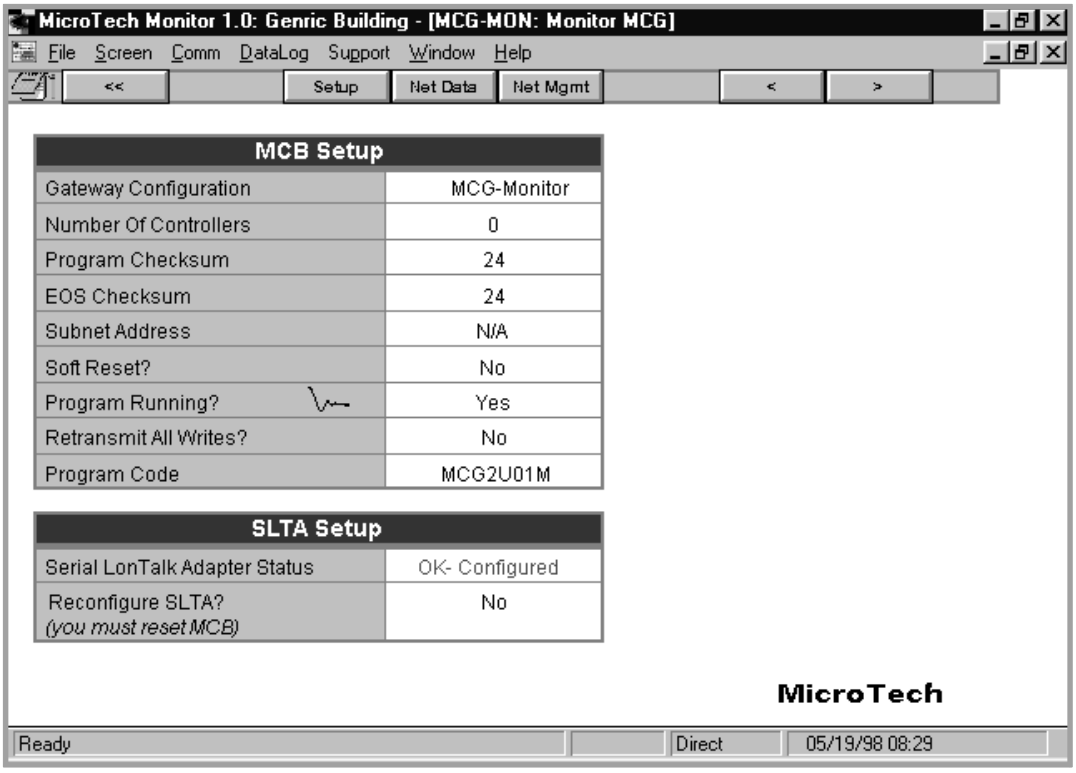
PC Connection Cable

An RS-232 communications cable kit that allows a PC to be directly connected to any MicroTech controller is available from McQuay International. The part number is 0057186802. The cable has a female DB-9 connector for connection to the PC's 9-pin serial port. (If the PC has a 25-pin serial port, obtain an adapter.) The cable length is 12 feet.

MCG Setup Variables

The MCG's setup variables can be accessed with a PC running the appropriate Monitor software. See Figure 17. (Windows-based Monitor is shown; DOS-based Monitor is similar.) After the network is commissioned, most variables should not need to be changed unless a HP controller is added or deleted.

Figure 17. MCG Setup Screen



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Gateway Configuration

For defintions of MCG terms, see "Applying the MicroTech Communications Gateway."

The Gateway Configuration variable tells you what the MCG's configuration is—"MCG-LMP" (level 2), "MCG-Monitor" (level 2) or "MCG-OP" (level 1). An MCG-OP has software that only works in an Open Protocol environment and has internal wiring set up for this purpose. An MCG-L2 panel may be configured as either an "MCG" (Open Protocol level 2), "MCG-Monitor" or an "MCG-LMP" (MicroTech BAS). It cannot be used as an MCG-OP.

▶ **To change the MCG's configuration**

1. Set the Gateway Configuration variable as required.

Configuration	Application
MCG-OP	Level-1 Open Protocol applications (DOS Monitor)
MCG	Level-2 Open Protocol applications (DOS Monitor)
MCG-LMP	MicroTech-BAS applications, Local Master Panel function (Windows Monitor)
MCG-Monitor	MicroTech-BAS applications, Monitor function (Windows Monitor)

2. Set the number of controllers. The number of controllers depends on the MCG configuration.

Configuration	Number of Controllers
MCG-OP	Always 0 (Open Protocol level 1 using MCG-OP)
MCG	Always 0 (Open Protocol level 2 using MCG-L2))
MCG-LMP	Number of MicroTech 2000 unit controllers connected to the MCGs
MCG-Monitor	Always 0

3. If the configuration is “MCG-OP” or “MCG-LMP,” set the Subnet Address variable as required. This variable is only adjustable when the Gateway Configuration variable is set to “MCG-OP” or “MCG-LMP.” (You may have to wait a few seconds after changing it before the change is reflected in Monitor screen.)
4. Reset the MCB by setting the Soft Reset? variable to “Reset” or by tuning the controller off and back on again.
5. Correct the MCB’s checksums by setting the Program Checksum variable equal to the EOS Checksum variable.
6. Reset the MCG. The MCB’s program starts running again. If the subnet address changed, it also reconfigures the MCB to the SLTA.

Note: If you want to change the subnet address after the HP unit controllers have been addressed, you must readdress the unit controller in order to transmit the new subnet address.

Number of Controllers

The Number of Controllers variable specifies how many MicroTech 2000 unit controllers are polled by the MCG-LMP for network communications. It is a decimal number. Note that the variable must be set *only in an MCG-LMP which is part of the MicroTech-only BAS that includes an level-1 NMP MicroTech controller.* It allows the NMP to send time schedules and system commands to the units and to receive alarms from the units.

Note: If the MCG configuration is “MCG-OP” “MCG” or “MCG-Monitor”, the Number Of Controllers variable must be set to 0.

Checksums

Checksums are used by the MCB to verify the integrity of its program. If the Program Checksum does not match the EOS Checksum after a reset occurs, the program stops running. The Program Checksum is adjustable; the EOS Checksum is not.

Some variables—for example, Gateway Configuration—cause the EOS Checksum to change when they change. Therefore, if you change one of these special variables, you must then (1) reset the MCB, (2) set the Program Checksum equal to the EOS Checksum, and (3) reset the MCB again.

Subnet Address

The Subnet Address variable specifies the subnet address for all MicroTech 2000 unit controllers associated with the “MCG-OP” and “MCG-LMP” configurations. (For the “MCG” and “MCG-Monitor” configurations, the subnet address is the same as hex switch setting of the MCG.).

If you change the subnet address, the SLTA must be reconfigured, and the nodes must be re-addressed (if they had previously been addressed). In this instance, the MCB automatically reconfigures SLTA after it is reset.

Retransmit All Writes?

The Retransmit All Writes? variable is useful only in a MicroTech-BAS. It causes the MCG-LMP to send NMP schedule and system command information to each unit. These writes automatically occur every 5 minutes, but if you want them to occur immediately, set this variable to “Yes.” The information is sent once, and this variable automatically returns to “No.”

SLTA Variables

The Serial LonTalk Adapter Status variable indicates whether the MCB has sent configuration data to the SLTA. If it has, the variable shows “OK–Configured.” Otherwise, the variable shows “Error–Unconfigured.”

You can force the MCB to reconfigure the SLTA with the Reconfigure SLTA? variable. The SLTA must be reconfigured if it is replaced—even if the Serial LonTalk Adapter Status variable shows "OK–Configured."

▶ **To reconfigure the SLTA**

1. Set the Reconfigure SLTA? variable to "Yes."
2. Reset the MCB by doing one of the following:
   a. Cycle power to the panel with the circuit breaker (CB1).
   b. Set the Soft Reset? variable to "Reset."

Node Installation

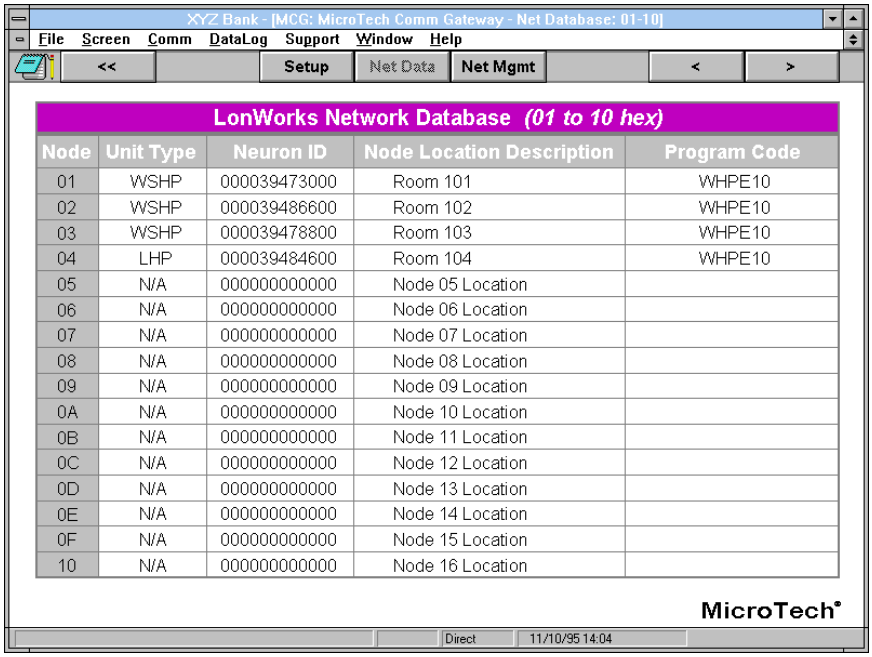
The process of node installation involves three steps:

1. Assign a subnet/node address to a controller
2. Verify communications
3. Verify the address assignment

Since the MCG sets the address via network communications, these three steps can be accomplished at the same time at each unit. For example, if you successfully set a node address in a HP unit controller, you have also verified that communications exist between the MCG and that controller.

Figure 18 and Figure 19 show the network database and network management Monitor screens. (Windows-based Monitor is shown; DOS-based Monitor is similar.) You use these screens during the node installation process.

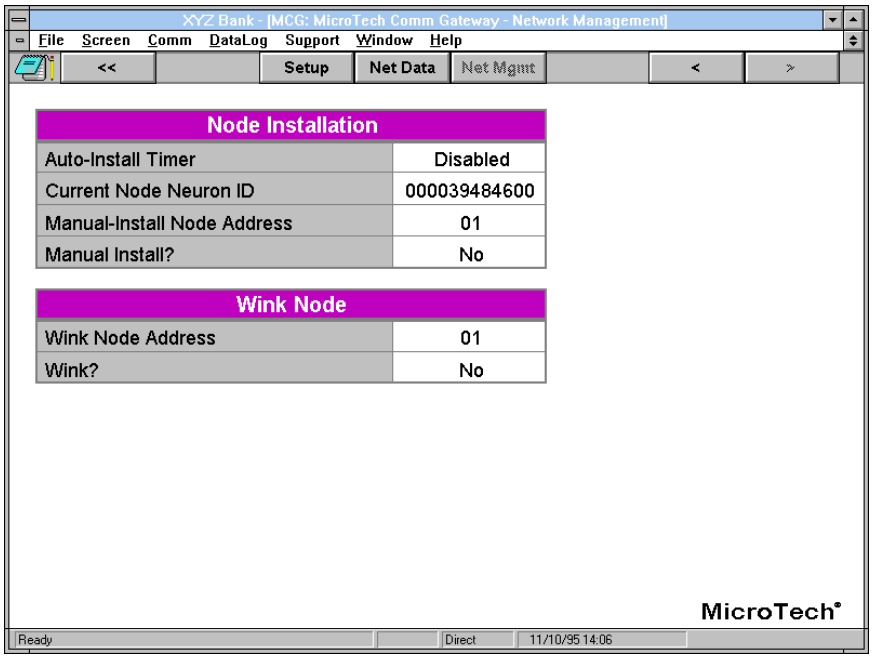
Figure 18. Network Database Screen (1 of 4 shown)



LonWorks Network Database *(01 to 10 hex)*

Node	Unit Type	Neuron ID	Node Location Description	Program Code
01	WSHP	000039473000	Room 101	WHPE10
02	WSHP	000039486600	Room 102	WHPE10
03	WSHP	000039478800	Room 103	WHPE10
04	LHP	000039484600	Room 104	WHPE10
05	N/A	000000000000	Node 05 Location	
06	N/A	000000000000	Node 06 Location	
07	N/A	000000000000	Node 07 Location	
08	N/A	000000000000	Node 08 Location	
09	N/A	000000000000	Node 09 Location	
0A	N/A	000000000000	Node 10 Location	
0B	N/A	000000000000	Node 11 Location	
0C	N/A	000000000000	Node 12 Location	
0D	N/A	000000000000	Node 13 Location	
0E	N/A	000000000000	Node 14 Location	
0F	N/A	000000000000	Node 15 Location	
10	N/A	000000000000	Node 16 Location	

Figure 19. Network Management Screen



Installation Methods

The HP unit controller is a LonWorks node. The Neuron chip in each LonWorks node has a unique 6-byte Neuron ID string that is assigned during manufacturing. During the installation process, *a logical network address is associated with an HP unit controller by means of the Neuron ID.* In the following discussion, the terms "node" and "HP unit controller" are interchangeable. Any of four installation methods can be used to do this:

1. Auto-Install: Specific
2. Auto-Install: Incremental
3. Manual-Install: Remote/Local
4. Manual-Install: Remote

As used here, the term "Auto-Install" means that the MCG automatically processes the address request, which originates at the node, and the term "Manual-Install" means that an operator at a PC executes a command to assign the address. The MCG automatically assigns an address only if the Auto-Install Timer is set to a non-zero value. When the timer expires addressing with the tenant override buttons at the heat pump wall sensor is disabled.

One of the first three methods must be used initially to address a controller because they each "pull out" the node's Neuron ID and broadcast it on the network. The MCG receives and stores the Neuron ID in the network database. The fourth method can be used only to readdress a node after its Neuron ID is stored in the network database.

Methods 1 and 2 can be done by one person walking from one HP wall sensor to another. Method 3 requires two people with two-way radios—one at the HP wall sensor and one at a PC. Method 4 can be done by one person at a PC. It may be best to choose one method and then stay with it until all the nodes are installed, but this is not necessary.

The table below summarizes the characteristics of each installation method.

Install Method	Persons required	Ability to assign specific address?	Ability to address node for first time?	Ability to readdress node?	Must node's Neuron ID be known?	Wall sensor use required?
Auto-Install: Specific	1	Yes	Yes	Yes	No	Yes
Auto-Install: Incremental	1	No	Yes	No	No	Yes
Manual-Install: Remote/Local	1 at node *and* 1 at PC	Yes	Yes	Yes	No	Yes *(or use Service button)*
Manual-Install: Remote	1 at PC	Yes	No	Yes	Yes	No

The type of network you are installing has an effect on some of the configuration decisions made at the MCG. Select from the following which of the three types of networks you are installing, and follow the instruction for setting the node addresses for that type of network.

Open Protocol Network, MCG-OP Panel

For defintions of MCG terms, see "Applying the MicroTech Communications Gateway."

This type of network uses a level-1 MCG-OP panel. The PC running the Monitor for DOS Open Protocol software is directly connected to the MCG-OP.

In almost all cases the node addresses are defined and recorded on a schedule. You must enter the assigned addresses so that the BAS network is complete.

▶ **To Auto-Install a node with the Specific method**

1. At the PC, set the Gateway Configuration variable in the MCG-OP to "MCG-OP" and set the Subnet Address variable to the specified subnet address. At the PC, set the Auto-Install Timer for the time you estimate necessary to address all nodes.
2. Go to the first HP wall sensor.

See the "Using the MicroTech Wall Sensor" section below for more information.

1. Use the tenant override button on the HP wall sensor to do the "Set Address" function (part of the "Select Function" event).
2. Enter the node address by doing the "Request Address" event.
3. The Status LED flashes the address you requested ("Feedback Address" event).
4. If the LED flashes the correct address, use the tenant override button to confirm the address request ("Confirm Address" event).
5. If you confirmed the address, the node performs the "Send Request" event, and generates a service pin message, which contains the node's Neuron ID and program code identification string. The service pin message is broadcast on the network and is received by the MCG-OP. If you do not confirm the address the request is ignored and, after a short delay, the sensor returns to normal operation.
6. Determine whether the MCG-OP received the service pin message and has issued the requested address by watching the Status LED on the HP wall sensor ("Confirm Receipt" event).
   a. If the Status LED flashes the address you requested, you have verified communications and the assigned address.
   b. If the Status LED does not flash an address (normal LED indication continues), the node did not receive an address. Verify that the Auto-Install Timer is set to a non-zero value, and check the network wiring.

Note: You can also verify this by observing the network database at the PC. The Neuron ID and program code identification string only appear in the MCG database at the requested node address if the address assignment was successful.

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9. Go to the next HP wall sensor and repeat steps 2 through 8 .

► **To Auto-Install a node with the Incremental method**

1. At the PC, set the Gateway Configuration variable in the MCG-OP to "MCG-OP" and set the Subnet Address variable to the specified subnet address. Set the Auto-Install Timer in the MCG-OP for the time you estimate necessary to address all nodes.
2. At the PC, verify that the MCG-OP Unit Type variable for each node address to be assigned is "N/A."
3. Go to the node that should receive the next unassigned address in the MCG's network database.

   The Unit Type variables are part of the network database. The *next unassigned address* is the next address after the highest address with a defined Unit Type. For example, if Node 03 Unit Type is set to "HP" and the Node 04 Unit Type through Node 40 Unit Type variables are all "N/A," the next unassigned address is 04. (This is true even if the Node 02 Unit Type is "N/A.") If all Unit Type variables are set to "N/A," the next unassigned address is 01.
4. Use the tenant override button on the HP wall sensor to do the "Set Address" function (part of the "Select Function" event). Do not enter an address ("Request Address" and "Send Request" events).

   See the "Using the MicroTech Wall Sensor" section below for more information on using the tenant override button.

   This generates a service pin message, which contains the node's Neuron ID and program code identification. The service pin message is broadcast on the network and should be received by the MCG-OP.
5. Determine whether the MCG-OP received the service pin message and issued the (next) address by watching the Status LED on the wall sensor ("Confirm Receipt" event).
   a. If the Status LED flashes an address, you have verified communications and the assigned address.
   b. If the Status LED does not flash an address (normal LED indication continues), the node did not receive an address. Verify that the Auto-Install Timer is set to a non-zero value and check the network wiring.

   Note: You can also verify this by observing the network database at the PC. The Neuron ID and the program code identification only appear in the MCG database at the next node address if the address assignment was successful.
6. Go to the next HP wall sensor and repeat steps 2 through 5.

▶ **To Manual-Install a node with the Remote/Local method**

1. *PC person:* At the PC, set the Gateway Configuration variable in the MCG-OP to "MCG-OP" and set the Subnet Address variable to the specified subnet address. Set the Auto-Install Timer in the MCG-OP to "Disabled".
2. *Both:* Using two-way radios, decide which node to address. You can go in any order.
3. *Node person:* Generate a service pin message, which contains the node's Neuron ID and program code, by doing one of the following:
   a. Using the tenant override button at the node, do the Set Address function (part of the "Select Function" event). Do not enter an address ("Request Address" and "Send Address" events).

   Or

   b. Press the "SERVICE " button on the MicroTech 2000 controller board.

See the "Using the MicroTech Wall Sensor" section below for more information on using the tenant override button.

4. *PC person:* Watch the Current Node Neuron ID variable. When a service pin message has been broadcast this variable should be updated with the Neuron ID from the node that generated the message. If no update occurs check the network wiring.
5. *PC person:* Set the Manual-Install Node Address variable to the desired address. Then set the Manual Install? flag to "Yes."
6. *Node person:* Confirm that the node received its address by watching the Status LED on the wall sensor ("Confirm Receipt" event).
   a. If the Status LED flashes the entered address, you have verified communications and the assigned address.
   b. If the Status LED does not flash an address (normal LED indication continues), the node did not receive an address. Verify that the Auto-Install Timer is disabled and check the network wiring.

Note: You can also verify this by observing the network database at the PC. The Neuron ID and the program code identification only appear in the MCG database at your requested node address if the address assignment was successful.

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7. *Both:* Repeat steps 2 through 6 for the next node.

► **To Manual-Install a node with the Remote method**

1. At the PC, type the Neuron ID of the node to be re-addressed into the Current Node Neuron ID variable field.

   You can find the Neuron ID in the network database. You may need to jot it down on a piece of paper.
2. Set the Manual-Install Node Address variable to the specified address. Then set the Manual Install? flag to "Yes."
3. Confirm that the node received its address by watching the network database. (This may take a minute or so.)
   a. If the Neuron ID moves to the specified node address, you have verified communications and the assigned address.
   b. If the Neuron ID does not move to the specified node address in the database, the node did not receive the new address. Check the network wiring.

Note: You can also verify this by observing the Status LED at the node. The Status LED flashes the address if the address assignment was successful ("Confirm Request" event).

Open Protocol Network, MCG-L2 Panel

For defintions of MCG terms, see "Applying the MicroTech Communications Gateway."

This type of network uses the level-2 MCG-L2 panel. The PC containing the Monitor for DOS Open Protocol software is connected to the Open Protocol Master Panel (OPM). Prior to addressing the nodes, you must establish MicroTech network communications between the OPM and the MCG-L2 panel. Refer to the OPM installation manual for instructions on establishing the MicroTech network communications.

In almost all cases the node addresses are defined and recorded on a schedule. You must enter the assigned address so that the BAS network is complete.

▶ **To Auto-Install a node with the Specific method**

1. At the PC, set the Gateway Configuration variable in the MCG-L2 to "MCG" and set the Auto-Install Timer in the MCG-L2 for the time you estimate necessary to address all nodes. The MicroTech level 2 address of this controller becomes the subnet address portion of the subnet/node address.
2. Go to the first HP wall sensor.

See the "Using the MicroTech Wall Sensor" section below for more information.

1. Use the tenant override button on the wall sensor to do the "Set Address" function (part of the "Select Function" event).
2. Enter the node address doing the "Request Address" event.
3. The Status LED flashes the address you requested ("Feedback Address" event).
4. If the LED flashes the correct address, use the tenant override button to confirm the address request ("Confirm Address" event).
5. If you confirmed the address, the node performs the "Send Request" event, and generates a service pin message, which contains the node's Neuron ID and program code identification string. The service pin message is broadcast on the network and should be received by the MCG-L2. If you do not confirm the address the request is ignored and, after a short delay, the sensor returns to normal operation.
6. Determine whether the MCG-L2 received the service pin message and has issued the requested address by watching the Status LED on the wall sensor ("Confirm Receipt" event).
   a. If the Status LED flashes the address you requested, you have verified communications and the assigned address.
   b. If the Status LED does not flash an address (normal LED indication continues), the node did not receive an address. Verify that the Auto-Install Timer is set to a non-zero value, and check the network wiring.

Note: You can also verify this by observing the network database at the PC. The Neuron ID and program code identification string only appear in the MCG database at the requested node address if the address assignment was successful.

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9. Go to the next HP wall sensor and repeat steps 2 through 8 .

► **To Auto-Install a node with the Incremental method**

1. At the PC, set the Gateway Configuration variable in the MCG-L2 to "MCG" and set the Auto-Install Timer in the MCG-L2 for the time you estimate necessary to address all nodes. The MicroTech level 2 address of this controller becomes the subnet address portion of the subnet/node address.
2. At the PC, verify that the MCG-L2 Unit Type variable for each node address to be assigned is "N/A."
3. Go to the node that should receive the next unassigned address in the network database.

   The Unit Type variables are part of the network database. The *next unassigned address* is the next address after the highest address with a defined Unit Type. For example, if Node 03 Unit Type is set to "HP" and the Node 04 Unit Type through Node 40 Unit Type variables are all "N/A," the next unassigned address is 04. (This is true even if the Node 02 Unit Type is "N/A.") If all Unit Type variables are set to "N/A," the next unassigned address is 01.
4. Use the tenant override button on the HP wall sensor to do the "Set Address" function (part of the "Select Function" event). Do not enter an address ("Request Address" and "Send Request" events).

   See the "Using the MicroTech Wall Sensor" section below for more information on using the tenant override button.

   This generates a service pin message, which contains the node's Neuron ID and program code identification. The service pin message is broadcast on the network and should be received by the MCG-L2.
5. Determine whether the MCG-L2 received the service pin message and issued the (next) address by watching the Status LED on the wall sensor ("Confirm Receipt" event).
   a. If the Status LED flashes an address, you have verified communications and the assigned address.
   b. If the Status LED does not flash an address (normal LED indication continues), the node did not receive an address. Verify that the Auto-Install Timer is set to a non-zero value and check the network wiring.

   Note: You can also verify this by observing the network database at the PC. The Neuron ID and the program code identification only appear in the MCG database at the next node address if the address assignment was successful.
6. Go to the next HP wall sensor and repeat steps 2 through 5.

▶ **To Manual-Install a node with the Remote/Local method**

1. *PC person:* At the PC, set the Gateway Configuration variable in the MCG-L2 to "MCG" and set the Auto-Install Timer in the MCG-L2 to "Disabled" The MicroTech level 2 address of this controller becomes the subnet address portion of the subnet/node address.
2. *Both:* Using two-way radios, decide which node to address. You can go in any order.
3. *Node person:* Generate a service pin message, which contains the node's Neuron ID and program code, by doing one of the following:
   a. Using the tenant override button at the node, do the Set Address function (part of the "Select Function" event). Do not enter an address ("Request Address" and " Send Address" events).

   Or

   b. Press the "SERVICE" button on the MicroTech 2000 controller board.

See the "Using the MicroTech Wall Sensor" section below for more information on using the tenant override button.

4. *PC person:* Watch the Current Node Neuron ID variable. When a service pin message has been broadcast this variable should be updated with the Neuron ID from the node that generated the message. If no update occurs check the network wiring.
5. *PC person:* Set the Manual-Install Node Address variable to the required address. Then set the Manual Install? flag to "Yes."
6. *Node person:* Confirm that the node received its address by watching the Status LED on the wall sensor ("Confirm Receipt" event).
   a. If the Status LED flashes the specified address, you have verified communications and the assigned address.
   b. If the Status LED does not flash an address (normal LED indication continues), the node did not receive an address. Verify that the Auto-Install Timer is disabled and check the network wiring.

Note: You can also verify this by observing the network database at the PC. The Neuron ID and the program code identification only appear in the MCG database at your specified node address if the address assignment was successful.

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7. *Both:* Repeat steps 2 through 6 for the next node.

► **To Manual-Install a node with the Remote method**

1. At the PC, type the Neuron ID of the node to be re-addressed into the Current Node Neuron ID variable field.

   You can find the Neuron ID in the network database. You may need to jot it down on a piece of paper.

2. Set the Manual-Install Node Address variable to the address you want. Then set the Manual Install? flag to "Yes."
3. Confirm that the node received its address by watching the network database. (This may take a minute or so.)
   a. If the Neuron ID moves to the specified node address, you have verified communications and the assigned address.
   b. If the Neuron ID does not move to the node address you specified, the node did not receive the new address. Check the network wiring.

Note: You can also verify this by observing the Status LED at the node. The Status LED flashes the address if the address assignment was successful ("Confirm Request" event).

MicroTech BAS Network, MCG-L2 Panel.

For defintions of MCG terms, see "Applying the MicroTech Communications Gateway."

This type of network uses two MCG-L2 panels per LonWorks subnet. Both panels are level-2 controllers, and must be connected to a Network Master Panel (NMP), which is a level-1 device. The PC running the Monitor for Windows job-specific software is connected to a Network Master Panel (NMP). Prior to addressing the nodes, establish MicroTech network communications between the NMP and the MCG-L2 panels. Refer to the NMP installation manual for instructions on establishing the MicroTech communications.

The two MCG-L2 panels together provide all network communications services and system controls required by the HPs. One panel must be configured as an MCG-Monitor. This MCG sets the HP unit controller addresses and provides the user interface. The second panel is responsible for transmitting alarm and system status information and must be configured as an MCG-LMP.

The subnet address portion of the subnet/node address is determined by the level 2 address of the MCG which is configured as the MCG-Monitor. This address is combined with the node address assigned during node installation to provide the complete subnet/node address. During addressing power down the panel configured as the MCG-LMP in order to prevent inadvertent addressing of the HPs.

In almost all cases the node addresses are defined and recorded on a schedule. You must enter the assigned address so that the Monitor software can access the correct unit.

▶ **To Auto-Install a node with the Specific method**

1. At the PC, set the Gateway Configuration variable in one of the MCG-L2 panels to "MCG-Monitor" and set the Auto-Install Timer in this MCG-L2 for the time you estimate necessary to address all nodes. The MicroTech level 2 address of this controller becomes the subnet address portion of the subnet/node address.
2. Go to the first HP wall sensor.

See the "Using the MicroTech Wall Sensor" section below for more information.

1. Use the tenant override button on the wall sensor to do the "Set Address" function (part of the "Select Function" event).
2. Enter the node address by doing the "Request Address" event.
3. The Status LED flashes the address you requested ("Feedback Address" event).
4. If the LED flashes the correct address, use the tenant override button to confirm the address request ("Confirm Address" event).
5. If you confirmed the address, the node performs the "Send Request" event, and generates a service pin message, which contains the node's Neuron ID and program code identification string. The service pin message is broadcast on the network and should be received by the MCG-L2. If you do not confirm the address, the request is ignored, and after a short delay, the sensor returns to normal operation.
6. Determine whether the MCG-L2 received the service pin message and issued the requested address by watching the Status LED on the HP wall sensor ("Confirm Receipt" event).
   a. If the Status LED flashes the address you requested, you have verified communications and the assigned address.
   b. If the Status LED does not flash an address (normal LED indication continues), the node did not receive an address. Verify that the Auto-Install Timer is set to a non-zero value, and check the network wiring.

Note: You can also verify this by observing the network database at the PC. The Neuron ID and program code identification string only appear in the MCG database at the requested node address if the address assignment was successful.

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9. Go to the next HP wall sensor and repeat steps 2 through 8 .

► **To Auto-Install a node with the Incremental method**

1. At the PC, set the Gateway Configuration variable in one of the MCG-L2s to "MCG-Monitor" and set the Auto-Install Timer in this MCG-L2 for the time you estimate necessary to address all nodes. The MicroTech level 2 address of this controller becomes the subnet portion of the subnet/node address.
2. At the PC, verify that the MCG-MON Unit Type variable for each node address to be assigned is "N/A."
3. Go to the HP that should receive the next unassigned address in the MCG's network database.

   The Unit Type variables are part of the network database. The *next unassigned address* is the next address after the highest address with a defined Unit Type. For example, if Node 03 Unit Type is set to "HP" and the Node 04 Unit Type through Node 40 Unit Type variables are all "N/A," the next unassigned address is 04. (This is true even if the Node 02 Unit Type is "N/A.") If all Unit Type variables are set to "N/A," the next unassigned address is 01.
4. Use the tenant override button on the HP wall sensor to do the "Set Address" function (part of the "Select Function" event). Do not enter an address ("Request Address" and "Send Request" events).

   See the "Using the MicroTech Wall Sensor" section below for more information on using the tenant override button.

   This generates a service pin message, which contains the node's Neuron ID and program code identification. The service pin message is broadcast on the network and should be received by the MCG-L2.
5. Determine whether the MCG-Monitor received the service pin message and issued the (next) address by watching the Status LED on the wall sensor ("Confirm Receipt" event).
   a) If the Status LED flashes an address, you have verified communications and the assigned address.
   b) If the Status LED does not flash an address (normal LED indication continues), the node did not receive an address. Verify that the Auto-Install Timer is set to a non-zero value and check the network wiring.

   Note: You can also verify this by observing the network database at the PC. The Neuron ID and the program code identification only appear in the database at the next node address if the address assignment was successful.
5. Go to the next HP wall sensor and repeat steps 2 through 5.

▶ **To Manual-Install a node with the Remote/Local method**

1. *PC person:* At the PC, set the Gateway Configuration variable in one of the MCG-L2s to "MCG-Monitor" and set the Auto-Install Timer in this MCG-L2 to "Disabled". The MicroTech level 2 address of this controller becomes the subnet portion of the subnet/node address.
2. *Both:* Using two-way radios, decide which node to address. You can go in any order.
3. *Node person:* Generate a service pin message, which contains the node's Neuron ID and program code, by doing one of the following:
   a. Using the tenant override button at the node, do the "Set Address" function (part of the "Select Function" event). Do not enter an address ("Request Address" and " Send Address" events).

   Or

   b. Press the "SERVICE " button on the MicroTech 2000 controller board.

See the "Using the MicroTech Wall Sensor" section below for more information on using the tenant override button.

4. *PC person:* Watch the Current Node Neuron ID variable. When a service pin message has been broadcast this variable should be updated with the Neuron ID from the node that generated the message. If no update occurs check the network wiring.
5. *PC person:* Set the Manual-Install Node Address variable to the address you want. Then set the Manual Install? flag to "Yes."
6. *Node person:* Confirm that the node received its address by watching the Status LED on the wall sensor ("Confirm Receipt" event).
   a) If the Status LED flashes the requested address, you have verified communications and the assigned address.
   b) If the Status LED does not flash an address (normal LED indication continues), the node did not receive an address. Verify that the Auto-Install Timer is disabled and check the network wiring.

Note: You can also verify this by observing the network database at the PC. The Neuron ID and the program code identification only appear in the MCG database at your specified node address if the address assignment was successful.

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7. *Both:* Repeat steps 2 through 6 for the next node.

► **To Manual-Install a node with the Remote method**

1. At the PC, type the Neuron ID of the node to be re-addressed into the Current Node Neuron ID variable field *of the MCG-L2 configured as the MCG-Monitor (important for correct addressing).*

   You can find the Neuron ID in the network database. You may need to jot it down on a piece of paper.
2. Set the Manual-Install Node Address variable to the address you want. Then set the Manual Install? flag to "Yes."
3. Confirm that the node received its address by watching the network database. (This may take a minute or so.)
   a. If the Neuron ID moves to the specified node address, you have verified communications and the assigned address.
   b. If the Neuron ID does not move to the node address you specified, the node did not receive the new address. Check the network wiring.

Note: You can also verify this by observing the Status LED at the node. The Status LED flashes the address if the address assignment was successful ("Confirm Request" event).

Using the Wink Command to Verify Installation

As discussed above, during address assignment you can verify that a node is communicating and that it has the correct address by (1) observing the Status LED at the node or (2) observing the row in the network database for the node address you are trying to assign. The Wink command provides another way to verify communications and address. Its advantage is that it can be done at any time after a node is addressed, not just during address assignment. It requires two people: one at the PC, and one at the node. A set of two-way radios is recommended.

The Wink feature uses simple cause-and-effect logic to prove communications and addressing. The *cause* is the Wink command, which is issued by an operator at a PC and directed at a specific node address. The *effect* is some physically observable event(s) that occur in the equipment at that node address. If the expected effects are observed in the expected piece of equipment, network communications exist and the node address is correct. If not, there is either a communications problem or the node is not addressed properly.

The following table lists the Wink effects in MicroTech 2000 unit controllers:

MicroTech 2000 unit controller	Wink effects (simultaneous)
HP	Status LED flashes (on 0.5 s/off 0.5 s) for 15 seconds
	Unit fan turns off for 5 seconds, on for 5 seconds, and then off for 10 seconds

Note: The Wink command temporarily interrupts normal unit operation.

⚠NOTICE

If a Wink command causes a component within a unit—such as a fan—to operate, be sure that the unit has been mechanically commissioned before sending a Wink command to it.

▶ **To verify installation with the Wink command**

1. *Both:* Decide which node to Wink.

   For example, assume that you want to Wink the HP unit in Room 103, which is supposed to be at node address 03.

2. *Node person:* Go to the room where you expect to observe the Wink effects.

   For the above example, you would go to Room 103.

3. *PC person:* Set the Wink Node Address variable to the node address you want to Wink. Then set the Wink? flag to "Yes." Using the two-way radio, let the node person know that you have done this.

   For the above example, you would set the Wink Node Address variable to 03.

4. *Node person:* Wait for the expected effect(s) to occur. They should happen soon after the Wink command is sent (within a minute).

   For the above example, you should see the Status LED on the wall sensor start flashing. If the unit's fan was off, you should hear it come on for 5 seconds. If the unit's fan was on, you should hear it go off for 5 seconds, come on for 5 seconds, go off for approximately 10 seconds, and then come on again.

See "Using the Query Feature to Verify Address" below.

If the Wink effects do not occur, use the wall sensor to Query the node for its address. If the node address is correct, check for network wiring problems.

Using the Service Pin Message to Verify Communications

A service pin message is a network message that is generated by a node and broadcast on the network. It contains the node's Neuron ID and program code. The MCG continually "listens" for service pin messages. If it receives one when the Auto-Install Timer is disabled, it places it in the Current Node Neuron ID variable's field. You can use this fact at any time—regardless of whether the node has an address—to verify network communications. One person can use this method, but two are recommended.

► **To verify communications with a service pin message**

1. At the PC, verify that the MCG's Auto-Install Timer is set to "Disabled."
2. At the PC, verify that the MCG's Current Node Neuron ID variable is set to "000000000000."

   This just makes it easier to see when a Neuron ID comes in.
3. Go to the node you want to test and briefly press the Service button, which is on the MicroTech 2000 controller board. The red LED next to the button should light.

   This generates and broadcasts the service pin message.

Note: You can also generate a service pin message by using the wall sensor's Set Address function. Just press and hold the tenant override button for more than 20 seconds (release when the LED goes to high brightness). This method works, but only if the wiring between the wall sensor and the node is intact. If there is any doubt, use the SERVICE button.

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4. At the PC, check the Current Node Neuron ID variable. It should be non-zero.

   It doesn't really matter what the Neuron ID is, just whether it is there. If it is there, network communications exist. If not, there is a problem. Check the network wiring.

Using the Query Feature to Verify Address

For detailed information, see the "Using the MicroTech Wall Sensor" section below.

MicroTech 2000 unit controllers include a Query feature, which can be used to check a unit's node address. Because the Query occurs completely within the unit controller, it cannot verify network communications. (Once a unit has an address, it retains that address regardless of whether network communications exist.) The Query feature makes use of the tenant override button and Status LED.

► **To verify a node address with the Query feature**

1. Select the Query function by pressing and holding the tenant override button on the node's wall sensor until the Status LED stays on at medium brightness (Select Function event). This takes approximately 10 seconds. Then release the button.

   The LED goes off for at least 5 seconds; flashes back the HI digit (if non-zero); pauses for 5 seconds; flashes back the LO digit (if non-zero); pauses for 5 seconds; and then returns to normal indication (Feedback Address event).
2. Count the number of HI digit flashes (high 0.8 sec/low 0.8 sec) and LO digit flashes (high 0.8 sec/off 0.8 sec). Remember to count in hexadecimal (0–F).

How the MCG Handles Addressing Conflicts

Occasionally, conflicts occur between existing address assignments and new address requests. There are two possible conflicts:

1. The node being assigned an address already has an address. (Its Neuron ID is thus in the network database.)
2. The address to be assigned has already been used.

Since the MCG coordinates node addressing, it is able to resolve these conflicts and at the same time prevent nodes with duplicate addresses. The following rules describe how it does this:

- A requested address is always assigned.

  This rule is true regardless of the address conflict (if any) and regardless of the installation method. (This assumes that the installation is performed properly; for example, if the Auto-Install Timer is not set, an address requested with an Auto-Install method is not assigned.)

- If conflict 1 occurs, the new address is assigned and the old address is cleared (unassigned) in the network database.

  For example, if a node with address 03 is assigned a new address of 04, the node's Neuron ID and Program Code in the network database move from the 03 row to the 04 row. The Node 03 Unit Type changes to "N/A," and the Node 03 Neuron ID changes to "000000000000."
- If conflict 2 occurs, the node that currently has the common address is unconfigured and then the address is assigned to the requested node. (When a node is unconfigured, its address is removed. The Status LED at such a node displays its normal unit status indication at low brightness.)

  For example, if node address 04 has been assigned to node A and then it is assigned to node B, node B gets address 04 and node A is unconfigured. The Neuron ID and Program Code for node B replaces those for node A at the 04 row in the network database. (The node A information is removed from the database.)

  These rules are applied as needed. In some instances all three may apply.

Using the MicroTech Wall Sensor

MicroTech room temperature sensors that are equipped with a remote Status LED and tenant override button can be used to install the nodes. These wall sensors eliminate the need to go to each unit and open its control panel—a difficult and time consuming task for some units such as ceiling mounted HP units. With the wall sensor, you can do the following:

- Do a normal tenant override button press.
- Obtain the current node address for that node.
- Set a specific node address (Auto-Install).
- Set an incremental node address (Auto-Install).
- Generate a service pin message (Manual-Install).

To do these things, you have two tools: a push-button switch and an LED. Because the tools are limited, information is entered and displayed by means of defined sequences of button presses, pauses, and LED flashes with varying time intervals and brightness levels. At first it may seem difficult, but with a little practice, using the wall sensor becomes easy.

Wall Sensor Functions

By pressing and holding the tenant override button for different lengths of time, you can select the wall sensor function you want. There are three possibilities:

- Tenant Override (hold button for 2–10 seconds)

  During scheduled unoccupied periods, the tenant override function normally causes the unit to start and run as if it were in occupied operation for some redefined time. On some units, a second button press for the Tenant Override function causes a different, defined effect; for example, it might turn off the unit before the timer expires. For more information, see the unit controller operation manual.
- Query (hold button for 10–20 seconds)

  The Query function allows you to find out what the node address is for the node the wall sensor is connected to.
- Set Address (hold button for more than 20 seconds)

  The Set Address function allows you to address a node with the Auto-Install or Manual-Install methods. As a safety, the Auto-Install methods work only when the Auto-Install Timer at the MCG is set. For the Remote/Local Manual-Install method, the Set Address function is used to generate a service pin message.

Status LED Exercise: How Bright is Bright?

The Status LED is capable of showing four brightness levels to convey information: high, medium, low, and off. During normal operation, the LED shows only two brightness levels; however, which two levels depends on whether or not the node has an address. If it has an address, the levels are high and off; if not, the levels are low and off. During the Query and Set Address functions, the LED may show all four brightness levels.

How bright is bright? Following is an exercise that you can perform to see the LED at medium brightness. Once you know what medium looks like, you can also tell when the LED is at high or low because it is either brighter or darker by comparison.

▶ **To see the LED at medium brightness**

1. Press and hold the tenant override button on a wall sensor for approximately 15 seconds. Then release the button. (This starts the Query function.)

   During most of the first 10 seconds, the LED should be flashing very rapidly. After 10 seconds and until you release the button, the LED glows at medium brightness.

Events

The sequences of button presses and LED flashes that make up the wall sensor functions can be thought of as combinations of "events." The following events are possible:

Event	Name	Brief description
SF	Select Function	Allows you to select the wall sensor function you want
RA	Request Address	Allows you to request an address assignment for a node
FA	Feedback Address	Shows you the address you requested (Set Address function); Shows you the node's current address (Query function)
CA	Confirm Address	Allows you to confirm that the requested address is correct
SR	Send Request	Sends the requested node address to the MCG for processing
CR	Confirm Receipt	Confirms that the node received an address and tells you what that address is

Select Function (SF)

The SF event is always the first event in any sequence. It begins when you press and hold the button, and it ends when you release the button. The length of time you hold the button determines the wall sensor function that follows. The Status LED provides visual feedback to let you know when to release the button—you don't need a stopwatch. See Figure 20 through Figure 22.

Figure 20. Select Function Event: Tenant Override

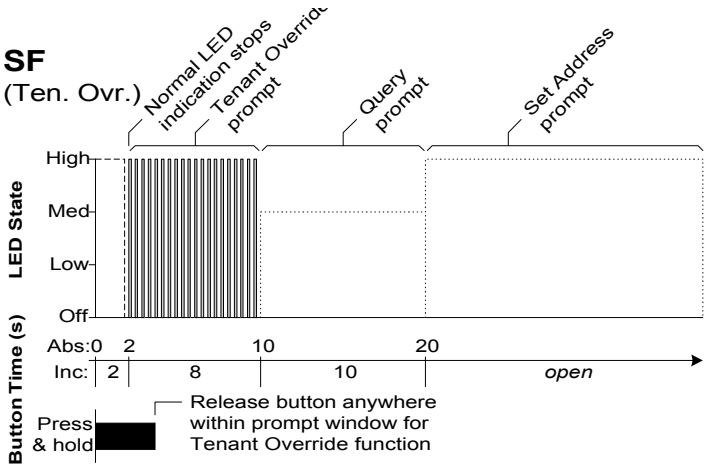


Figure 21. Select Function Event: Query

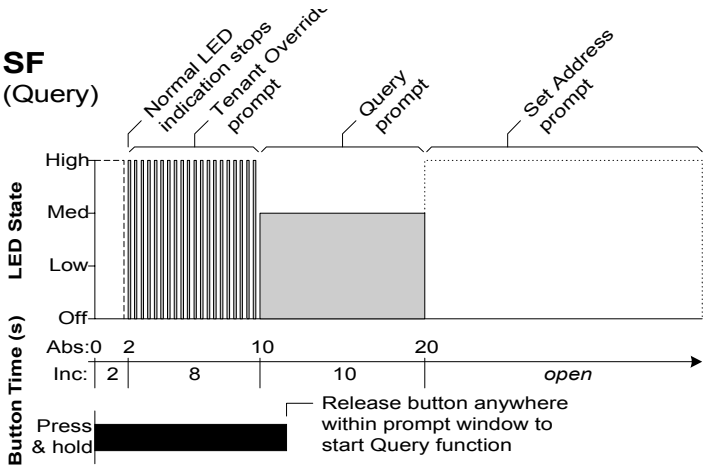
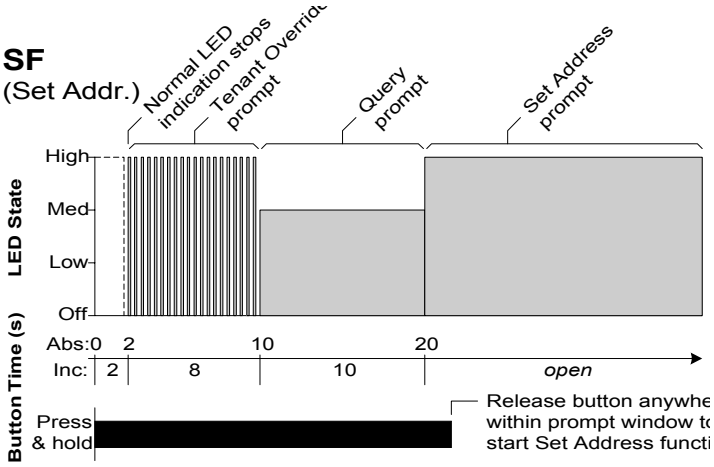


Figure 22. Select Function Event: Set Address



Request Address (RA)

The RA event allows you to request an address for a node during the Set Address function. The way you request the address depends on the installation method you're using. For the Auto-Install methods, you enter the exact address using the button (Specific) or enter nothing to get the next available address (Incremental). For the Remote/Local Manual-Install method, you enter nothing since the address is requested at the PC.

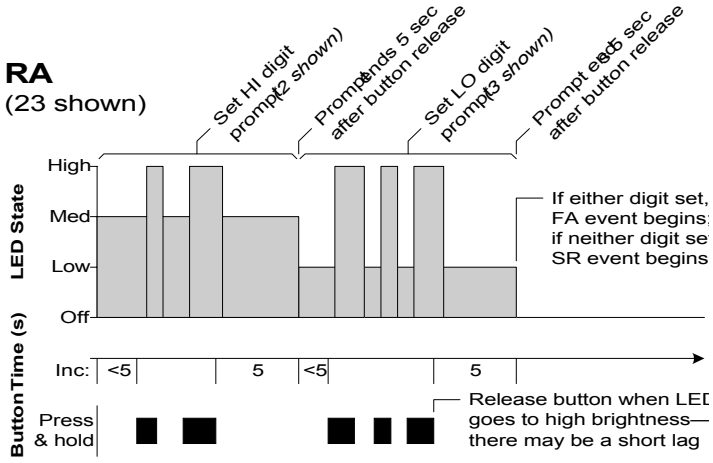
The RA event consists of two Status LED prompts: one to set the HI digit (medium brightness) and one to set the LO digit (low brightness). You request a digit by pressing the button that many times during the proper prompt. When you press the button, the LED goes to high brightness. See Figure 23. For example, to set the node address 23, press the button twice when the LED is at medium brightness, wait 5 seconds, and then press the button three times when the LED is at low brightness.

Each prompt ends 5 seconds after the last button press. To request the digit "0," do not press the button.

Note: The HI and LO digits are hexadecimal. Since a maximum of 64 (hex 40) nodes are allowed, the range of possible HI digits is 0 to 4, and the range of possible LO digits is 0 to F. To enter an alphabetical digit, press the button that many (decimal) times. Decimal equivalents to alphabetical hex digits are as follows: A=10, B=11, C=12, D=13, E=14, F=15.

Tip: There is a brief lag after you press the button before the LED goes to high brightness. Just hold the button until you see the LED go high; then release it.

Figure 23. Request Address Event



Feedback Address (FA)

The FA event is used during the Query and Set Address functions. The event looks the same in these two functions, but its meaning is slightly different (see below).

Using the Status LED, the FA event shows the node address one digit at a time: first the HI digit and then the LO digit. Each digit is a series of flashes; the flash count is equal to the digit. To help you distinguish between the digits and other events, there is a 5-second pause before the HI digit, after the LO digit, and between the two digits. Each HI digit count is a flash from high brightness (0.8 s) to low brightness (0.8 s). Each LO digit count is a flash from high brightness (0.8 s) to off (0.8 s). See Figure 24.

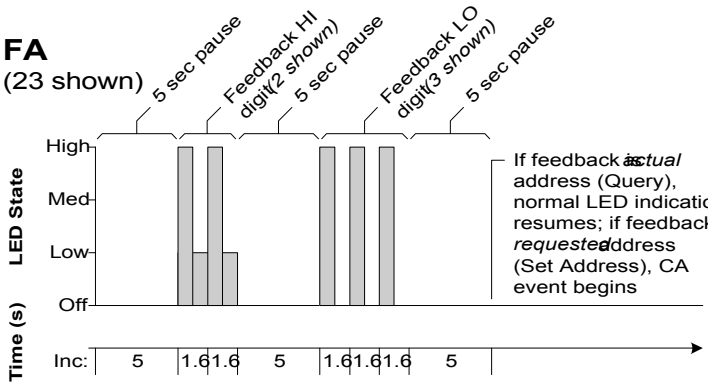
For the digit "0," no flashes occur, and the two 5-second pauses around it (HI or LO) merge into a 10-second pause.

Query: During the Query function, the FA event tells you what the actual node address is (if any). You can tell whether the node has an address by looking at the LED during normal (unit status) indication. If the LED's indication is at high brightness, the node has an address. If the LED's indication is at low brightness, the node does not have an address (i.e., it is "unconfigured").

Set Address: During the Set Address function, the FA event tells you what specific address the controller thinks you requested during the Request Address event. (If no address was requested, the FA event does not occur.) It allows you to verify that the requested address is correct before you are given the chance to confirm the request with the CA event.

Note: The HI and LO digits are hexadecimal. Since a maximum of 64 (hex 40) nodes are allowed, the range of HI digits is 0 to 4, and the range of LO digits is 0 to F. Decimal equivalents to alphabetic hex digits are: A=10, B=11, C=12, D=13, E=14, F=15.

Figure 24. Feedback Address Event

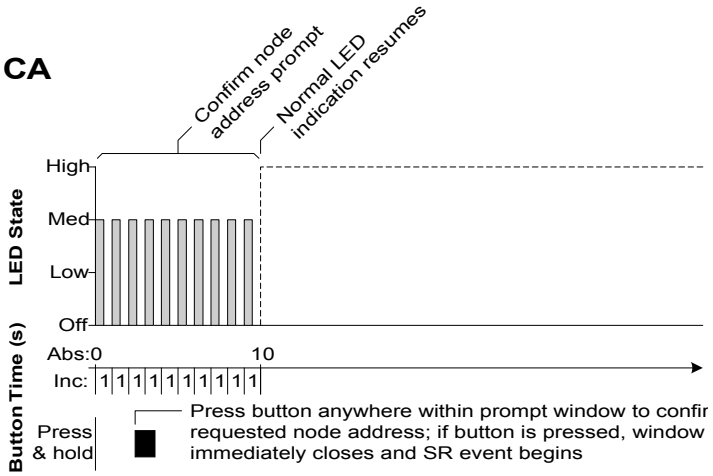


Confirm Address (CA)

The CA event allows you to confirm a specific address you requested during the Set Address function. (If no address was requested, the CA event does not occur.) If the address is correct, simply press the button once during the prompt. If the address is not correct, do nothing.

The prompt is a series of quick flashes (on 0.5 s/off 0.5 s) at medium brightness. If you press the button to confirm the address request, the prompt and the CA event ends immediately, and the SR event begins. If you do not press the button, the prompt and the CA event end after 10 seconds, and normal LED indication resumes. See Figure 25.

Figure 25. Confirm Address Event



Send Request (SR)

The SR event tells the MCG that the node would like an address assigned to it. The message that is sent to the MCG includes these three pieces of data:

1. Neuron ID
2. Program Code
3. The requested node address

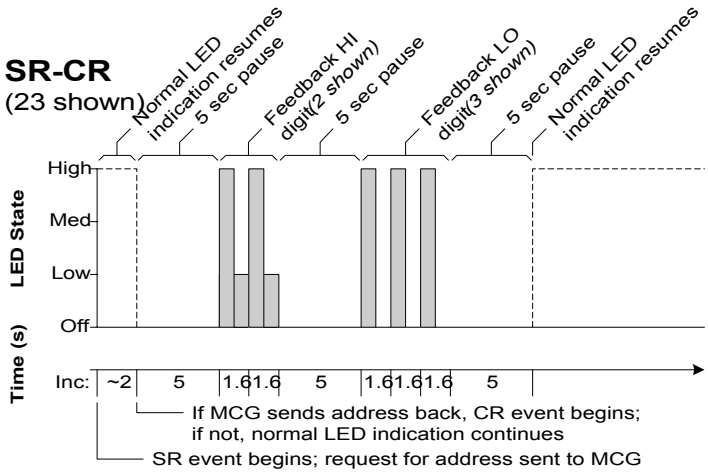
If the MCG's Auto-Install feature is on, it interprets a requested node address of 00 as a request for an incremental address. If the Auto-Install feature is off, it ignores the requested node.

The SR event is a little different from the other events in that no button press is required and no special LED indication is associated with it. The LED actually returns to normal indication while the SR event is happening. (This usually takes only 1 to 3 seconds.) See Figure 26.

If you're using an Auto-Install method, the SR event is immediately followed by the CR event—if the address was assigned. If the CR event does not begin (i.e., normal indication continues), the address was not assigned. This could occur if the MCG's Auto-Install Timer is disabled or network communications does not exist.

Note: The first two pieces of data that are sent during the SR event, the Neuron ID and program code, constitute a service pin message. Another way to send a service pin message is to press the Service button, which is mounted on each MicroTech 2000 controller board. Since a requested address is not required for a Manual-Install, this technique can be used instead of the wall sensor's Set Address function when you're installing with the Remote/ Local method.

Figure 26. Send Request and Confirm Receipt Events



Confirm Receipt (CR)

The CR event occurs whenever the node receives an address from the MCG regardless of the installation method. If the CR event does not occur, the address assignment was not successful. In addition to telling you that the address assignment was successful (by its existence), the CR event tells you what the node address is. In this sense, it is identical to the FA event described above in "Feedback Address (FA)." See Figure 26.

Event Sequences and Examples

The following table shows various event sequences that you can expect for the various functions and installation methods:

Scenario	Event sequence
Tenant Override function	SF
Query function	SF→FA *(see Figure 27 through Figure 29)*
Set Address function, Auto-Install: Specific, successful	SF→RA→FA→CA→SR→CR *(see Figure 31 and Figure)*
Set Address function, Auto-Install: Specific, unsuccessful	SF→RA→FA→CA→SR
Set Address function, Auto-Install: Specific, request not confirmed	SF→RA→FA→CA
Set Address function, Auto-Install: Incremental, successful	SF→RA→SR→CR *(see Figure 30)*
Set Address function, Auto-Install: Incremental, unsuccessful	SF→RA→SR
Set Address function, Manual-Install: Remote/Local, successful	SF→RA→SR CR *(after PC operator executes)*
Manual-Install: Remote, successful	CR *(after PC operator executes)*

Graphic examples are shown below in Figure 27 through Figure 32.

Figure 27. Query Example: Node Address 0A Shown

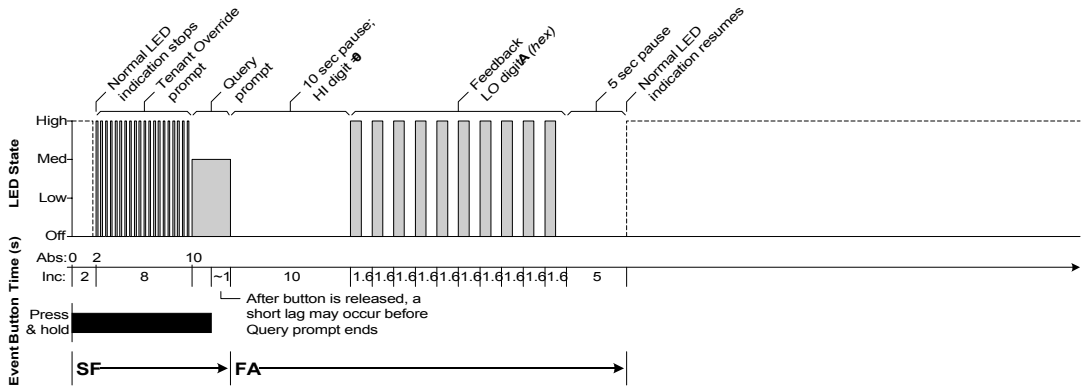


Figure 28. Query Example: Node Address 24 Shown

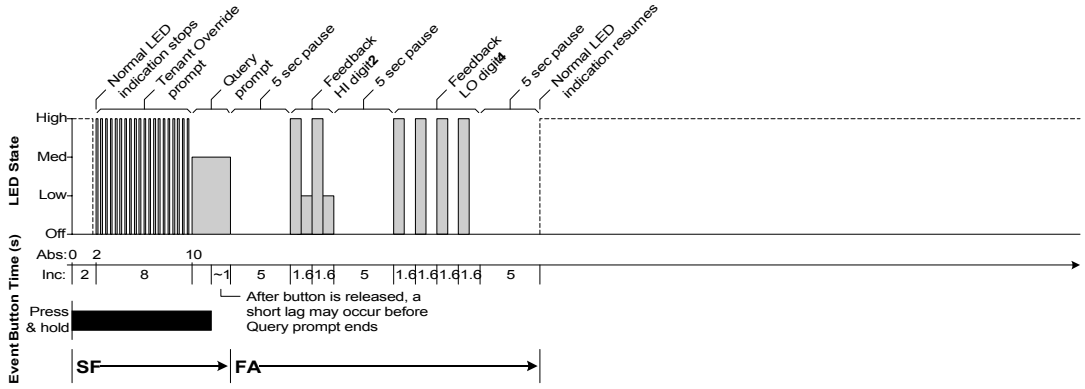


Figure 29. Query Example: Node Address 30 Shown

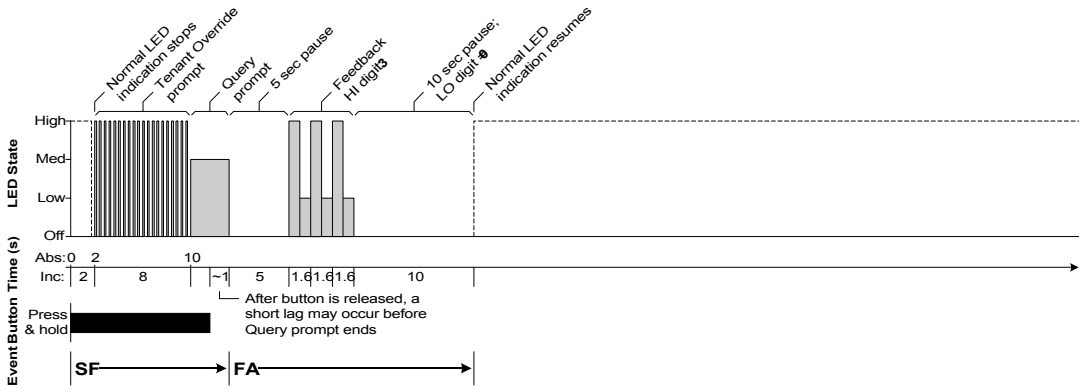


Figure 30. Set Address Example Using the Incremental Auto-Install Method: Node Address 0E Shown

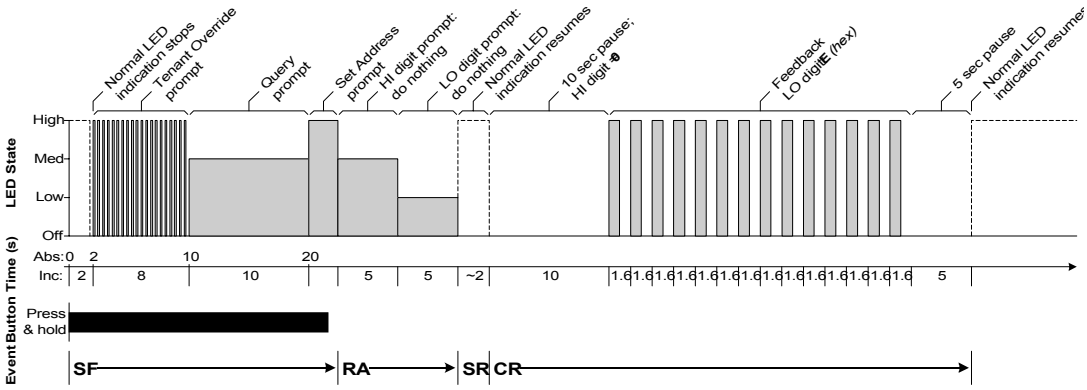


Figure 30. Set Address Example Using the Specific Auto-Install Method: Node Address 03 Shown

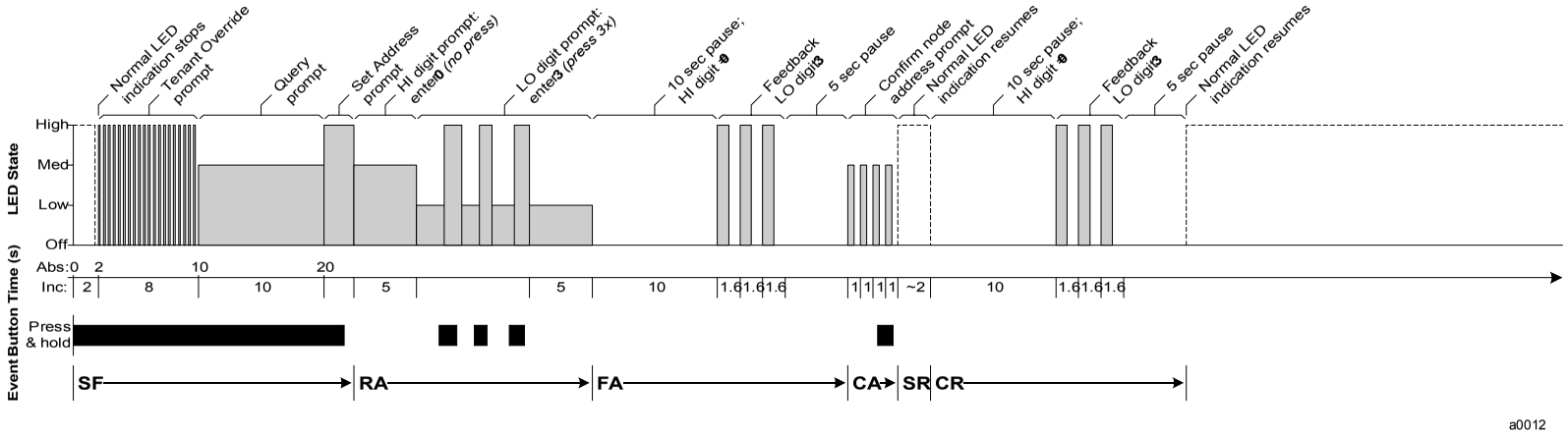
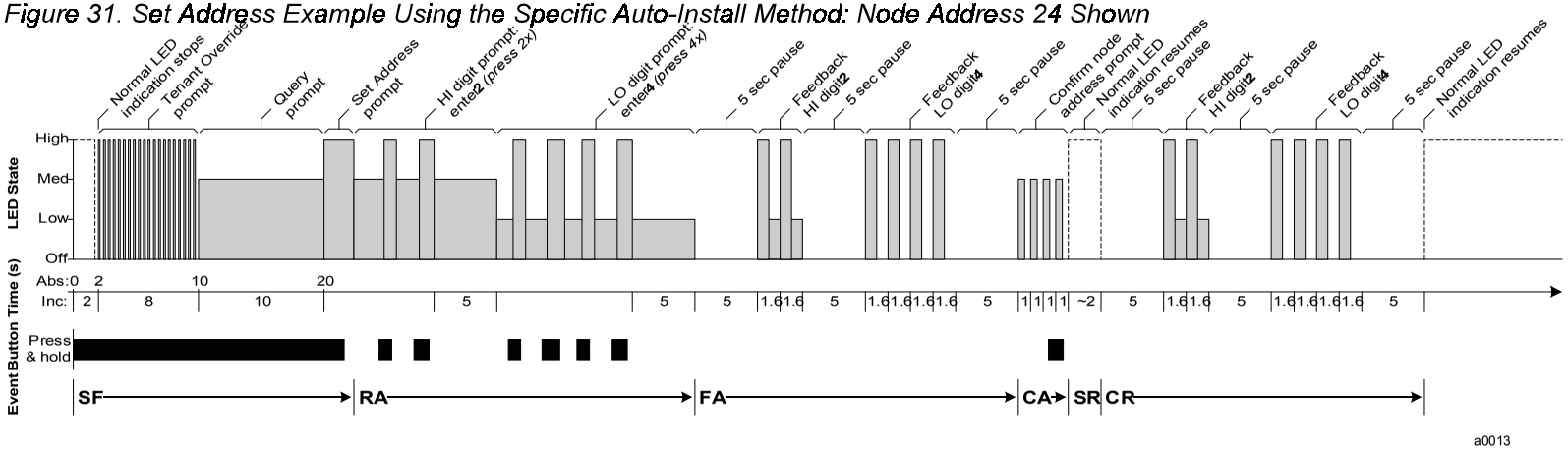


Figure 31. Set Address Example Using the Specific Auto-Install Method: Node Address 24 Shown



Wiring Diagrams

The following wiring diagrams are identical to the ones in the MCG panels. They are reproduced here for your convenience. Figure 33 shows the “MCG-L2” panel , and Figure 34 shows the “MCG-OP” panel. The legend is shown in Table 10.

Table 10. MCG Schematic Legend

Component Designation	Description
CB1	Circuit Breaker
MCB	Microprocessor Control Board
SLTA	Serial LonTalk Adapter
T1	Transformer: 115/24 Vac
T2	Transformer: 24 Vac/18 Vac-CT
TB1	Terminal Block: High Voltage Section
TB2	Terminal Block: Low Voltage Section
—911—	Factory Wire Number
-◎—	Field Wiring Terminal
— — —	Field Wiring
	Printed Circuit Board Terminal
=⊖=	Twisted, Shielded Pair Cable

Figure 33. MCG Schematic: "MCG-L2" Panel

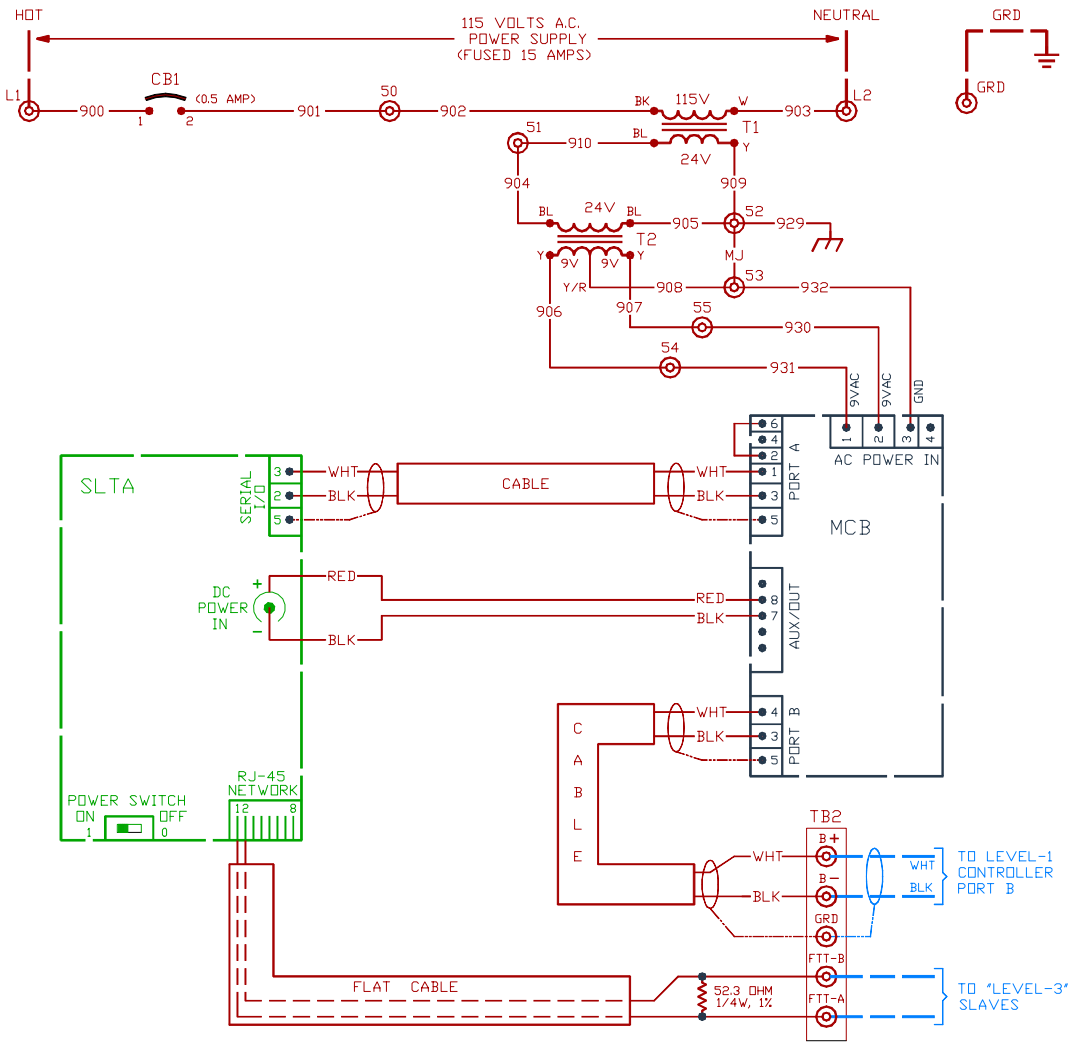
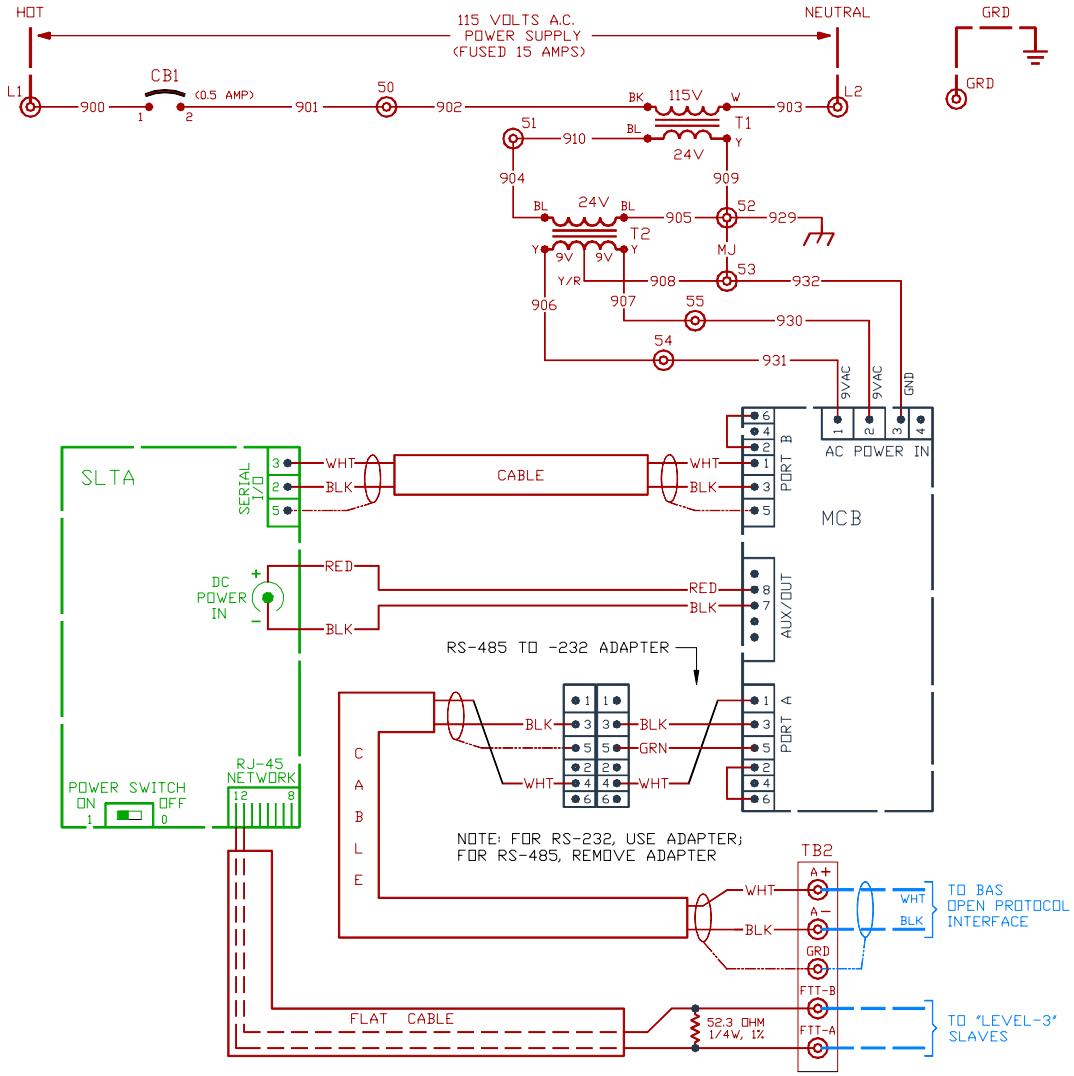


Figure 34. MCG Schematic: "MCG-OP" Panel



Test Procedures

A listing of MicroTech related part numbers is included in the "Parts List" section. If the MCB must be replaced, refer to the "MCB Replacement" section.

Status LED Diagnostics

The MCB status LED indications can aid in controller diagnostics. If the status LEDs do not operate normally as described in the "Component Data" section (see Table 3 and Table 4), there is a problem with the MCB. Following are troubleshooting procedures for the various symptoms.

Red LED Remains On

If the red LED remains on after the 5-second self-test period, it is likely that the MCB is defective. However, this can also occur in some instances if there is a power supply problem. Refer to "Troubleshooting Power Problems" below.

Red and Green LEDs Off

If the red and green LEDs do not turn on after power is applied to the controller, there is likely a defective component or a problem in the controller's power distribution circuits. Refer to "Troubleshooting Power Problems" below.

Green LED On, Amber LED Off

If the green LED is on and the amber LED remains off, it indicates that the MCB's program is not executing. This usually means that the Program Checksum does not match the EOS Checksum. With the Monitor program, set the Program Checksum equal to the EOS Checksum and then reset the controller. You can reset the controller by setting the Soft Reset? variable to "Reset" or by cycling power to the panel.

- If the checksums match and the problem persists, try downloading the program again.
- If the amber LED remains off, the MCB is likely defective.

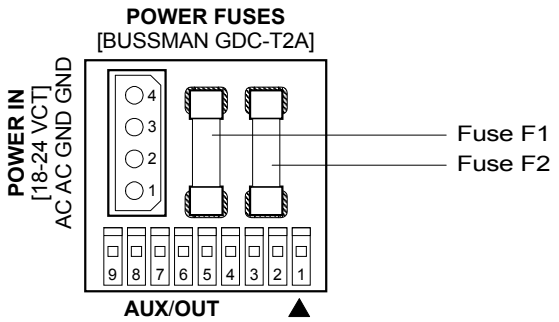
Troubleshooting Power Problems

The MCB receives 18 Vac, center-tapped power from transformer T2. It then distributes 12 Vdc power to the SLTA. A problem that exists in any of these components can affect the MCB and thus the entire control system. Power problems can be caused by an external short, which can blow a fuse, or a defective component, which can either blow a fuse or create an excessive load on the power supply. An excessive load can lower the power supply voltages to unacceptable levels. Use the following procedure to isolate the problem. This procedure may require two or three spare MCB fuses (see parts list). Refer to the panel-wiring diagram (Figure 33 or Figure 34) as you proceed.

▶ **To troubleshoot power problems**

1. Verify that circuit breaker CB1 is closed.
2. Remove the MCB Power In terminal strip connector and check for 9 Vac between the terminals on the plug corresponding to terminals 2 and 3 on the board (see Figure 2 and Figure 35). Then check for 9 Vac between the terminals on the plug corresponding to terminals 1 and 3 on the board. (Readings of 9–12 Vac are acceptable.)
   a. If 9 Vac is present between both sets of terminals, go to step 3.
   b. If 9 Vac is not present between both sets of terminals, check transformers T2 and T1 and all wiring between the 115 Vac source and the Power In plug.
3. Remove power from the controller by opening circuit breaker CB1. Check the MCB power supply input fuses (F1 and F2) with an ohmmeter. See Figure 35. A good fuse has negligible resistance across it (less than 2 ohms).
   a. If either or both fuses are blown, replace them. Go to step 4.
   b. If the fuses are intact, the MCB is defective.
4. Reconnect the Power In plug and disconnect all other connectors on the MCB. Cycle power to the controller (close and then open CB1) and check the power fuses.
   a. If both fuses are intact, go to step 5.
   b. If either fuse blows, the MCB is defective.
5. Reconnect the Aux/Out connector plug to the MCB. Cycle power to the controller and check the power fuses.
   a. If both fuses are intact, the problem is indeterminate. Obtain factory service.
   b. If either fuse blows, it is likely that the SLTA is defective.

Figure 35. MCB Power Supply Terminals



Troubleshooting Communications Problems

If you suspect that a network communications problem exists, you can verify it by doing a Wink command or by sending a service pin message. The Wink is a network message sent from the MCG to a particular node, and the service pin message is a network message sent from a node to the MCG. If either message does not get to its destination, a problem exists. The service pin message verifies only communications. The Wink verifies both communications and the node's address. For more information, see "Node Installation" in the "Network Commissioning" section.

If you know there is a communications problem, use the following guidelines as you try to find it:

1. Determine whether there is a pattern.
   a. Do you have problems with just one controller, more than one controller, or all controllers?
   b. If all controllers are not communicating, check the connections around the MCB and SLTA, verify that the SLTA is configured, verify that the termination resistor is installed, and look for shorts across the network conductors. If the problem seems to be with the MCB or the SLTA, obtain factory service.
   c. If a group of contiguous controllers is not communicating, look for a disconnection.
   d. If one controller is not communicating, look for a disconnection and try swapping a known good controller. If the good controller communicates, the suspect controller is defective.
2. The normal impedance across the two network conductors is negligible.
   a. If you use an ohmmeter to check the resistance across the two network conductors, you must disconnect each terminal plug from its board. This is because the FTT-10 transceiver on the board contains a transformer that is connected across the conductors. (The resistance across this transformer is approximately 6 ohms.) If all boards are disconnected from the network, the resistance should be approximately 52 ohms, which is the resistance of the termination resistor(s). *If only one controller is left connected, it appears as a short.*

Troubleshooting the SLTA

Troubleshooting the SLTA is limited to verifying that it has power and verifying that it is configured.

Power

When the SLTA is powered up, its Service LED should flash on for about one-half second and then go off. If the LED does not flash, check for 12 Vdc at the power plug. If there is power, replace the SLTA (see below).

Configuration

The Serial LonTalk Adapter Status variable tells you whether the SLTA was successfully configured. If it shows "Error-Unconfigured," do the following:

- Verify that the cable is connected between the SLTA serial port and the correct communications port on the MCB (port A for "MCG" configuration, port B for "MCG-OP" configuration).

- Verify that the SLTA has power. (See "Power" above.)
- If you find and correct a problem, reset the MCB by (1) cycling power to the panel or (2) setting the Soft Reset? flag to "Reset."

The SLTA holds its configuration data in EEPROM, which has a maximum write limitation. The source of the configuration data is the MCB. If the MCB's Reconfigure SLTA? flag is set to "Yes," it writes the configuration data to the SLTA when it resets. If the write was successful, the flag changes to "No," preventing additional writes. If the write was not successful, the flag remains at "Yes." The MCB automatically reconfigures the SLTA (upon reset) if the subnet address changes.

If You Replace the SLTA

If you replace the SLTA for any reason, *you must manually reconfigure it—even though the Serial LonTalk Adapter Status variable shows "OK-Configured."* For information on how to do this, see "MCG Setup Variables" in the "Network Commissioning" section.

Note: There are jumpers within the SLTA that must be set properly for the MCG application. If you obtain a replacement SLTA from McQuay International, the jumpers should be preset. If not, you should match the jumpers to those on the defective SLTA.

MCB Replacement

If an MCB board is defective and must be replaced, the proper controller software must be loaded into the replacement MCB. This can be done either at the factory or at the building site—if a PC equipped with appropriate Monitor software is available.

The factory loads the proper controller software into a replacement MCB board before it is shipped if you include the MCG's program code with the replacement MCB part order. If the program code is not provided, the MCB board is shipped without software.

Job-specific Monitor software includes each unit and auxiliary controller's program. Therefore, it is possible to download the proper controller software to a replacement MCB at the building site if a PC equipped with that job's Monitor software is available. Refer to the user's manual supplied with the Monitor software for more information.

Parts List

Component Designation	Description	Part No.
MCB	Microprocessor Control Board ①	654873B-60
SLTA	Serial LonTalk Adapter	594443B-01
T1	Transformer: 115/24 Vac	606308B-01
T2	Transformer: 24/18 Vac, Center Tapped	467381B-14
CB1	Circuit Breaker	350A733H03
–	Fuse: MCB Input Power, 2 A (Bussman No. GDC-2A)	658220A-01
–	Fuse: MCB Communication Ports, 0.25 A	658219A-01
–	PC Communications Cable Kit	0057186802

Notes:
If desired, the factory can load the correct software into the replacement MCB prior to shipment.

McQuay International

13600 Industrial Park Boulevard, P.O. Box 1551, Minneapolis, MN 55440 USA (612) 553-5330